MEDICAL SERVICES AND HEALTH STATUS IN THE NORTHWEST HEALTH REGION OF BRITISH COLUMBIA: A THREE YEAR PERSPECTIVE

by

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ABSTRACT

Providing efficient and effective health services to the residents of rural and remote regions of Canada has been the focus of much research since the implementation of universal medical care in 1967. A great deal research has been carried out by the individual provinces regarding physician supply and physician services utilisation, as well as attempts to determine an appropriate measure of population health status. While many of these measures have been assessed individually for several regions there are very few examples of integration of the measures to assess the degree to which they might influence one another.

This thesis presents a descriptive analysis of measures of physician supply, physician services utilisation, and population health status, and includes a correlational analysis of the relationship between these variables. The focus of this study is specific to the Northwest Health Region of British Columbia and the eight Local Health Areas of which it is comprised since this area is characterised as having a shortage of physicians and their services, as well as having poor health status.

Measures of physician supply are used to determine if there is an adequate supply of general practitioner and medical specialist practitioners in the Northwest compared to other Local Health Areas in the province and the provincial median. Utilisation of and accessibility to physician services is also examined to determine if there is reasonable access to physician services in the Northwest as compared to other areas in the province. A health status index is formulated from standardised mortality ratios and other rates in an attempt to describe the population health status of the 79 British Columbia Local Health Areas and, more specifically, of those in the Northwest Health Region. The values derived

from this health status index are correlated with physician supply and utilisation values to assess whether or not any association exists.

The study found that despite the many difficulties in recruiting and retaining physicians in the Northwest there seemed to be a reasonable supply of both general practitioner and medical specialist physicians in the Region at the time of the study. It was also shown that the ability of residents to access general practitioner services within the Region was also deemed to be reasonable. Access to medical specialist services, however, was shown to be lacking in most Local Health Areas and an area of concern for the Region as a whole.

The population health status of the region was found to be dichotomous with two Local Health Areas enjoying a reasonable level of health status while the six others had values that rated as some of the worst in the province. The association between health status and physician supply and utilisation was shown to be weak with only a few significant values that did not suggest a definitive relationship between these variables. This lends strength to the argument of the 'determinants of health' model which criticises the contribution that medical services makes to population health.

This study has discovered some important uses for the various measures of physician supply, physician utilisation, and population health status for the Northwest Health Region. However, there is still a need for further research in this area and a need for the assessment of other Local Health Areas, Health Regions and provinces.

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CHAPTER 1

INTRODUCTION

A great deal of research in Canada has focused on ways of providing efficient and effective health care services to the population. A proportion of this has been directed towards the problems of providing health services for those in non-urban areas, areas considered rural and remote. One underlying rationale of this research is that the populations of these areas have both perceived and documented disparities in their health status and that health services are more difficult to provide in such areas.

The British Columbia Royal Commission on Health Care and Costs stated that many residents of rural and remote areas desired better measures of health and sought improved access to the full spectrum of health services (British Columbia, 1991). The title of the Commission's report, *Closer to Home*, expresses the concept of the need to promote the development of health services in the regions of British Columbia and their constituent local health areas.

Subsequent to the Report of the Royal Commission, a Northern and Rural Health Task Force was established by the Minister of Health to address the disparities in access to health services and health status of British Columbians in rural and remote regions compared to urban residents (British Columbia, 1995b). The Task Force noted that more research was required to address these issues, recommending:

> Increas[ing] research to identify and develop more accurate and appropriate measures of population health. Where feasible, indicators should be collected at the regional and community level. Also, provide useful information on health outcomes related to health services, at provincial and regional levels. (British Columbia, 1995b, 18)

This recommendation serves as a background to this study which seeks to formulate a methodological framework and to develop measures that can be utilised by others in a similar context and in a variety of settings.

Specifically, the thesis addresses issues associated with the provision of medical services and health status in the local health areas (LHAs) of the Northwest Health Region of British Columbia. This Region was chosen for two reasons. The first reason was that the University of Northern British Columbia has a mandate to serve the region. Secondly, the decision to focus exclusively on the Northwest Health Region was due to the unique and challenging geographical and socio-economic characteristics that impact upon the health of the population and the delivery of health care services.

This area, as the name suggests, encompasses a large area in the Northwestern portion of the Province. The Region is characterised by a rugged and isolated geography, with road access to the smaller communities being limited by virtue of terrain and climate, especially beyond the main roads. Particularly difficult to access are the Queen Charlotte Islands, which are separated from the rest of the Region by ocean straits. The population of the Region is widely distributed and is made up of smaller communities that are located at varying distances from the larger centres of Terrace, Smithers, and Prince Rupert.

Terrace is the 'central' and most populous community in the region and is 140 km from Prince Rupert and 200 km from Smithers by road. Other communities in the region are located with access to either Terrace or Smithers, depending on their situation. For example, the community of Hazelton is 135 km from Terrace and 70 km from Smithers.

The community of Kitimat is 60 km from Terrace but is 260 km from Smithers. Dease Lake, located in the Stikine LHA, is 600 km from Terrace and 620 km from Smithers.

Figure 1.1 shows the Province of British Columbia divided along LHA boundaries. It emphasises the LHAs of the Northwest Health Region and displays the major population centres of the region.

Figure 1.1: British Columbia LHAs with Emphasis on the Northwest LHAs and Communities

The economic profile of the Region is rooted primarily in resource based industries, including timber harvesting, fishing, mining, and other related operations. In addition, there is a diverse cultural and social environment in the Northwest, including a high percentage of aboriginal populations in some areas of the Region. This combination of characteristics makes the study of access to health care services and of the health status of the Region a challenging and interesting undertaking.

Three areas are explored in this thesis, specifically: physician supply, physician services utilisation, and the health status of the residents of the Northwest Health Region. After examining each of these areas individually, the health status of the Region is correlated with physician supply and services to determine whether or not a relationship exists between these variables. The results will serve as a foundation for further understanding the relationships between medical services utilisation and health status, and which can be used to provide information to the various stakeholders in rural and remote health, including government agencies, policy analysts and researchers, community leaders, and health care providers.

Chapter 2 examines a selected literature related to physician supply and distribution, physician services utilisation, and health status and its measurement. The statements of the problems addressed in this thesis follow the review of the literature. Chapter 3 outlines the methodology used in this study, including the study design, data analyses, and limitations of the study. Chapter 4 presents the results and subsequent discussion of physician supply in the Northwest Health Region. Chapter 5 examines the results and discussion related to physician service utilisation and the associated issues arising from access to these services for the Northwest. Chapter 6 displays the results of

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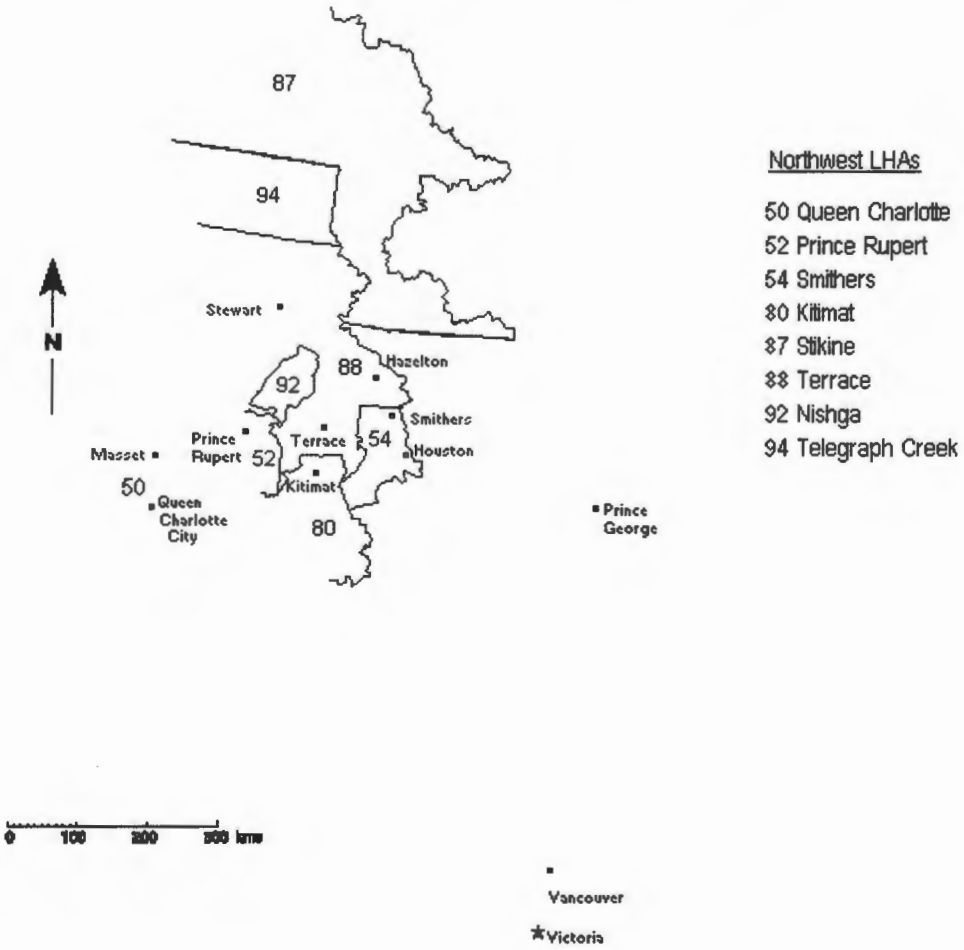


the formulation of a health status index as they apply to the Northwest. Chapter 7 examines the findings of the correlational analysis between physician resources and health status specifically for the Northwest Health Region. Chapter 8 summarises the major results and conclusions and connotes the implications of the findings for policy and for further research.

CHAPTER 2

REVIEW OF THE LITERATURE AND PROBLEM STATEMENTS

In this chapter, the literature related to physician supply and distribution, to the utilisation of health services, and the measurement of health status is reviewed. This review will focus on the literature related to issues and events specifically relevant to rural and remote areas. As this thesis is specific to an area of British Columbia that is considered northern and remote, this approach allows for the most relevant literature to be addressed.

Physician Supply and Distribution

The means by which medical practitioners are distributed throughout British Columbia and Canada, or indeed any other jurisdiction, is said to be a complex process that does not always follow market dynamics (Brown, 1993). This section will focus on the historical background from which the present situation evolved with respect to the supply and distribution of physicians in Canada and specifically in BC. It will then review methods by which physician distribution is measured and, finally, the factors that relate to recruitment and retention of physicians, especially in rural areas such as the Northwest.

The Canadian Experience. The provision of medical and hospital services has traditionally been regarded as a provincial responsibility, although the development of the so-called Canadian health care system has been guided by successive legislation and fiscal initiatives from the Federal government.

The seminal debate, however, over the issue of physician supply and distribution was joined in the context of a comprehensive review of health services in Canada, a review that was stimulated by the prospect of the introduction of universal medical care

in the late 1950s. This comprehensive review took the form of the establishment of the Royal Commission on Health Services (otherwise known as the Hall Commission) in 1960, a Commission that reported in 1964 (Canada, 1964).

In reviewing the supply of physician services in the context of prospective universal medical insurance, the Royal Commission noted that the population/physician ratio was 857:1. This ratio was high enough to cause concern about the ability of the current and projected supply of physicians to meet the future demand for medical services from a rapidly growing population that was predicted to maintain its natural rate of growth established through the post-war period. It therefore recommended that the enrolment quotas of medical schools in Canada be immediately increased and that four new medical schools be developed with an anticipated production of approximately 1860 medical graduates annually by 1991. Since expansion of domestic medical graduate output would not have an immediate effect, the immigration of foreign physicians was also encouraged (Rachlis and Kushner, 1994).

While the Royal Commission approached its task of projecting the requirements for physicians based on the best evidence that it had available at the time, three factors were to have an impact on the ultimate supply of physicians that has become available to Canada.

First, the projections of population growth by natural increase far exceeded the actual growth that took place as the 'baby boom' of the 1950s was followed by markedly lower reproductive patterns.

Secondly, the Royal Commission's estimates of the net migration of physicians were conservative and the annual net influx of physicians approached the output of the

Canadian medical schools, peaking at 1170 in 1973. The flow was stemmed in 1975, when immigration regulations were changed at the request of the provinces (Taylor, 1986).

Thirdly, fears that physicians would leave the country as a result of the implementation of publicly administered universal medical care (which took place in 1967) were not realised and there was no massive exodus of Canadian doctors.

Since the medical schools had responded to the challenge to increase their enrolment and three new medical schools opened before the turn of the 1960s, physician supply continued to grow throughout the 1970s and 1980s.

The British Columbia Experience. British Columbia experienced the national growth in physician supply, a growth rate that was further exacerbated by the internal migration patterns of physicians from other provinces to BC. In the past 25 years, the number of physicians per capita in BC has grown by a full 50 percent and is still growing at twice the rate of the population (Yaffe, 1994).

In the early 1980s, the BC Ministry of Health identified the fact that, while the ratio of population to physicians in BC was perhaps the most favourable in Canada due to increased medical school graduation and population movements, most of the regions outside of the lower Mainland and Greater Victoria had not benefited from this rich supply. The maldistribution of physicians within the Province remained.

In order to address this concern the BC legislature passed Bill 41 in 1985. The Bill contained a law permitting the government to restrict the issuance of billing numbers to physicians. This would allow the Ministry of Health to limit the number of physicians who could practice since, without billing numbers, doctors would be unable to bill for

their services through the provincial Medical Services Plan (Barer, 1988). The Ministry could also control where doctors practised by providing billing numbers to physicians who were prepared to set up practice in non-urban areas. However, no sooner had the legislation been passed than it was challenged in the courts and found to be unconstitutional under the Canadian Charter of Rights and Freedoms (Lomas and Barer, 1986). This ruling rendered Bill 41 ineffective, nullifying this attempt by the government to control physician supply and distribution.

In 1991, the entire provincial health care system was scrutinised by the British Columbia Royal Commission on Health Care and Costs, chaired by Justice Peter Seaton. After 18 months of canvassing the Province, the Commission reported its findings and recommendations in *Closer to Home* (British Columbia, 1991). Its recommendations became the foundation of the 1993 government policy document, *New Directions for a Healthy British Columbia*, an ambitious undertaking by the newly elected NDP government aimed at decentralising and regionalising the health care system and controlling costs (British Columbia, 1993a). This restructuring required policies that would influence the distribution of physicians, particularly to meet the needs for regions outside of the lower Mainland.

In late 1993 the provincial government and the BCMA reached a five year 'working agreement' that contained key elements concerning physician remuneration, supply and distribution. One provision in the working agreement called for the formation of a task force on physician supply (British Columbia, 1993b). A Task Force was established and was made up of representatives of the Ministry of Health, the BCMA and other stakeholders in the health care system (British Columbia, 1994a).

While the Task Force deliberated on a long-term physician supply strategy, other provinces had introduced measures limiting the numbers of physicians and their billings. It became imperative for BC to implement interim measures to discourage doctors who had been 'shut out' of other provinces from coming to British Columbia. The Medical Services Commission issued a minute on February 10, 1994 declaring that "all medical practitioners applying for and receiving a billing number between February 11, 1994 and July 1, 1994" would be remunerated at 50 percent of the scheduled payment for all medical services (British Columbia, 1994b). The measures had a significant impact as a deterrent to new practitioners coming to British Columbia from other provinces, since applications for billing numbers fell by a third (British Columbia, 1994c). The granting of exceptions to physicians prepared to practice in areas with a demonstrated need was not as effective. Despite the disincentives for urban practice and the incentives for rural practice, the majority of physicians starting or relocating practices in British Columbia continued to do so in the more urbanised areas of the Province (OReilly, 1994). The requirement for physicians in underserved areas continued to be an important issue in need of discussion.

The Report of the British Columbia Task Force on Physician Supply was received in 1994 and contained nineteen policy options for managing the supply of physicians in British Columbia, together with thirteen recommendations emanating from these options. The key recommendations were:

- establishing a contract/bursary system for medical students to serve in underserved areas or disciplines
- promoting the Rural Practice Program at UBC medical school
- establishing guidelines for population/physician ratios for specialties
- providing full billing numbers on the basis of demonstrated need

- requiring immigrant physicians to sign contracts to serve specific communities in order to receive a billing number
- requiring that billing numbers be retired at a specified age, possibly aided by incentives (British Columbia, 1994a).

In conjunction with the Task Force, the BCMA Physician Supply Committee drafted a report entitled *Managing the Physician Supply Life Cycle in British Columbia.* The policy recommendations contained within this report dealt specifically with encouraging physicians to locate in rural and isolated areas through modified training programs and bursary provision. Medical graduates would be better trained to practice in non-urban areas of the Province and would be provided monetary incentives to increase the supply of physicians in rural areas. The report also recommended the establishment of a central locum service for physicians practising in isolated areas and offering of retirement incentives for practising physicians (British Columbia Medical Association, 1994).

Before the interim measures expired on July 1, 1994, the Medical Services Commission extended them indefinitely, pending development of permanent measures to be developed by the Ministry of Health and the BCMA (British Columbia, 1994c). These measures have subsequently been redrafted in the British Columbia Physician Supply Plan, released October 31, 1996 (British Columbia, 1996a).

To aid in the recruitment of physicians to remote and rural communities in British Columbia, the Health Employers Association of British Columbia (HEABC) began a Physician Recruitment Program in 1996 that assists communities, regions and hospitals in recruiting physicians (HEABC, 1996). This program complements the work of the Physician Supply Team at the Ministry of Health's Practitioner Services Branch. The

recently released British Columbia Physician Supply Plan also addresses rural practice recruitment with the addition of a vacancy listing for communities and facilities, and specifying physician remuneration formulae for all areas of the Province (British Columbia, 1996a).

Recruitment and Retention Factors. Most Canadian rural communities feel that they need the presence of one or more physicians to provide their immediate medical services. Areas in need of medical practitioners have traditionally advertised in medical journals, newspapers and health care publications. Many provinces use incentives, such as bursaries and 'tax holidays,' to address physician shortages within their rural communities (Luski, 1995, Rubin, 1981).

Many factors determine why physicians choose to set up and maintain a medical practice in a rural or remote area. These factors can be categorised into central themes: area of origin and educational environment; lifestyle and family considerations; and professional satisfaction and support.

It has been shown that medical students who originate from rural areas are more likely to locate their practices in rural areas than those of urban origin and recommendations have been made with regard to emphasising this factor as a criterion for selection for entry to medical school (Barer and Stoddart, 1991; BCMA, 1994; CMA, 1992; Fickenscher, 1992). The environment of the medical school has also been shown to influence the practice location of physicians. Medical schools and their teaching hospitals are located in urban centres and many new physicians become accustomed to having advanced technology at their disposal (Barer and Stoddart, 1991; Rourke, 1993). In order to provide students with an opportunity to experience rural medical practice first-hand,

several medical schools now offer exposure to rural practice as part of their undergraduate clinical rotations (Gilmore, 1985; CMA, 1989; BCMA, 1994). This includes the University of British Columbia (UBC) Medical School, which offers rural rotations through Family Practice Units in Prince George, Nanaimo, and the Fraser Valley.

Barer and Stoddart (1991) describe how lifestyle factors are central to the choice of practice location, outweighing financial incentives or income considerations (Jennissen, 1992). For example, opportunities for spouse (Rourke, 1993) and children's educational needs (Barer and Stoddart, 1991) are cited as important factors influencing a physician's practice location. The availability of continuing medical education, support by and consultation with colleagues, and access to adequate medical facilities were other stated influences for those physicians considering rural and remote practice (Barer and Stoddart, 1991; Luski, 1995).

Quantifying the Requirements for Physicians

Quantifying physician distribution and need has been dominated by the use of population/physician ratios. These describe the size of the population in relation to the number of physicians practising in a province or region. Both raw numbers of physicians and full time equivalents (FTEs)[1] have been used, though popular convention now exclusively favours the use of FTEs (British Columbia, 1994a; British Columbia, 1996a; BCMA, 1994; Young, 1996). In 1994/95 the population/physician ratio in British Columbia for all physicians was 522:1. This translates to 898:1 for general practitioners and 1247:1 for all specialties (British Columbia, 1995a).

Such ratios, however, reveal little about the health care system in place, the organisation of medical practice and the effectiveness of the services provided (Horne, 1986; Canadian Medical Association, 1992). In a benchmark paper on the issue of physician services in rural and remote communities, Horne (1986) criticised the use of population/physician ratios as a means of defining medical service provision. He noted that ratios tend to ignore the difference between general practitioners and specialists (Horne, 1986). He also observed that lower ratios in rural areas may not indicate a lack of service in these areas but, rather, might indicate "an inefficiently high density" of practitioners in the urban areas. Further, communities that are 'underserved' may seek medical services in adjacent communities or in major referral centres distant from their actual community.

Hence, it has been suggested that the search for an 'optimal' number of physicians or the concept of a 'magic ratio' is no more than a fallacy (Barer and Stoddart, 1991). They theorise that formulating physician supply based on epidemiological models is not necessarily the best way to serve the health care needs of the public. They stress that "an optimal number of physicians cannot be defined by purely technical means" and that "ultimately, this is a social rather than a technical judgement" (Barer and Stoddart, 1991).

An alternative to the traditional population ratio approach is to identify the actual medical service utilisation by all residents in a region or area. This allows for comparisons of medical services received with other regions or areas. Further, indices of utilisation may elucidate the degree to which remote and rural areas are receiving services

[1] An FTE defines the amount of work by a physician and is discussed in the 'Sources of Data' section of chapter 3. The detailed formula is found in Appendix 2.

and can identify areas that are 'underserved' or 'overserved.' Nevertheless, the fact that some areas may receive more or less services than other areas does not provide a measure of the services that are actually needed.

Geographical Level of Analysis for Health Measures. In British Columbia the measurement of all health care delivery and utilisation is regularly measured at three hierarchical levels. The broadest measurement is the 'Provincial' level, where indices are based on the provincial data. For example, ratios are based on the provincial population and costs are based on the provincial budget allocation.

Although the provincial level gives an overall indication of the level or status of the indicator being measured, it is too broad to make valid conclusions beyond the general level. However, the provincial average often serves as the baseline for comparisons with other levels and jurisdictions (British Columbia, 1996a; Mohamed, Macdonald, Collison, Uh and Foster, 1992; Foster, Burr and Mohamed, 1994).

The next level is the 'Regional' level. The Province of BC is divided into 20 Health Regions (previously 21 before reorganisation in 1994) which vary widely in geographical size and population. A comparison of indices across the different Regions with the provincial average as the baseline becomes a central focus for analyses of the functioning of the health care system and its outcomes.

Nevertheless, given the variation in the population size and the heterogeneity within the Regions, intra-regional differences in health care indices can be masked. Differing indices within a Region have the potential to "cancel each other out" in the final analysis (Foster et al., 1994).

Hence, a third level, the Local Health Area (LHA), is often used by the Ministry of Health as the unit of analysis. British Columbia's 79 LHAs are approximately the same size and area as the School Districts and usually contain one major community as well as one or more smaller centres. The number of LHAs per Region ranges from one (Vancouver, Burnaby, and Richmond) to eight (Northwest) and their 1995 populations range from a high of 529310 (Vancouver) to 754 (Telegraph Creek) (British Columbia, 1996b).

The specificity of the LHA allows for more valid and meaningful comparisons between geographical areas in British Columbia. In addition, using 79 separate units allows for a statistically powerful analysis of variation between the LHAs, especially if multiple years are used.

The Ministry of Health uses postal code translation files to assign data to the appropriate LHA and, while using data at the postal code level is possible as evidenced by several studies (Goody, 1993; Radany and Luft, 1993; Roos, 1993; Spasoff and Gilkes, 1994), it requires time consuming and costly analysis and the degree of reliability is reduced because of the small number of cases per postal code areal unit (Mohamed et al., 1992). Hence, the use of the LHA as the unit of analysis has considerable advantages.

Issues of Access. The 1984 Canada Health Act (Canada, 1984) enshrined the principle of accessibility to health services as a condition for continuing federal support to the provinces for health care programs. Hence, in theory, all Canadians should have equal access to medical services and it is the responsibility of the provinces to ensure that access meets the conditions of the Canada Health Act.

Equal access can be defined as the availability of resources to meet a medical need. The interpretation of the legislation, however, is debatable (Birch and Abelson, 1993). While it may be true that accessibility is not limited in the sense that there can be no economic barriers at the point of service, there are issues that arise with respect to the geographical accessibility of services and the costs that various populations (especially Northern and rural areas) may incur in accessing services. In fact, some authors report real limitations on access for those living in rural areas of Canada (Jennissen, 1992), while others have shown that access in some rural communities is not compromised, compared to similar communities with more stable medical services (Horne, 1986). There are several ways in which access to medical services can be measured and, although no one measure is preferred over another, each has unique merits.

One measure of access is the distance one must travel to receive physician services. It can be argued that the further one has to travel, the lower the level of access. How that distance is determined is debatable since geographical distance alone may not fully capture the accessibility. Hence, travel time by vehicle has been used in several studies of smaller areas (Horne, 1986; Joseph and Phillips, 1984; Thouez, Bodson, and Joseph, 1988). Other variables that need to be taken into account would be the cost of travel, including both direct costs and opportunity costs.

Tallying the number of services actually provided is another measure of accessibility, a measure that suggests that, if a patient has been able to contact a physician, the service is accessible. Utilisation indices for specific populations are usually expressed as rates per 1000 population, standardised for age and sex. Such standardised rates allow for comparison with other LHAs, regions or provinces.

Utilisation can also be expressed in the dollar value of the payments per 1000 population, although this measure reflects the 'intensity' of the medical services provided rather than basic accessibility. Both dollar value and number of services were used by Horne (1986) in his analysis of rural medical care utilisation and by Tataryn, Roos, and Black (1994) in their comprehensive study of utilisation of physician resources in Manitoba.

Using a different approach, Tataryn et al. (1994) also measured the percentage of residents making contact with a physician as a measure of access. They showed that residents living in Winnipeg contacted a physician at 1.05 times the rate of non-Winnipeg residents and suggested that this indicated that rural residents had a 'reasonable' degree of access to physician services. This measure was also used in another Manitoba study (Fakhoury and Roos, 1996) but does not seem to have been adopted by other investigators.

A ratio of patients to population index has been used, a ratio based on the percentage of the population that was classified as 'patients' (i.e., had contact with a physician) in a given period of time. The use of this patient/population ratio carries the caveat that, in small areas (such as LHAs), minor changes in population numbers as well as factors that influence access to medical care (e.g. a physician in a previously 'undoctored' area) may make such ratios unstable as a measure of accessibility (McCrea, personal communication, 1996).

Describing the percentage of services rendered within the LHA should give an excellent indication of access, given that LHAs are such defined areal units. This information is readily available from the Ministry of Health and preliminary analysis

seems to indicate its usefulness in predicting a degree of access that is truly 'closer to home.' Using the percentage of services rendered within a region is also useful for broader comparison (Tataryn et al., 1994). However, many of the regions have a large hospital (i.e., a regional or district hospital) that more often will provide medical services to a majority of residents in the region and the difference in accessibility between LHAs may be masked (see also: British Columbia, 1996a).

Measures of Population Health Status

The definition of health and health status has evolved over recent decades and, in 1993, British Columbia formally endorsed the World Health Organization's definition of health as:

> ... a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. It is the extent to which an individual or group is able, on one hand, to realise aspirations and satisfy human needs and, on the other hand, to change or cope with the environment. Health is therefore seen as a resource for everyday life, not the objective of living; it is seen as a positive concept emphasising social and personal resources, as well as physical capacities (British Columbia, 1993a, 5).

This broad and comprehensive definition, however, poses a challenge in terms of measuring the health status of populations. Nevertheless, a variety of indicators have been developed and used for research and the ones commonly adopted in Canada are reviewed below.

Socio-economic Risk Index. This index, developed in Manitoba by Frohlich and Mustard (1994), is predicated on the link between socio-economic status and health status. It is based on six indicators derived from national census data. These indicators are:

- percentage of population between the ages of 25 and 34 that graduated from high school
- percentage of the labour force between 15 and 24 years of age that is unemployed
- percentage of the labour force between 45 and 54 years of age that is unemployed
- percentage of single parent female households
- percentage of female labour force participation
- average dwelling value

This measure was used in a subsequent Manitoba study and was found to correlate with the levels of need for health services identified by the use of Standardised Mortality Ratios (Tataryn et al., 1994).

The use of indices of socio-economic status as surrogate measures for health status and for health needs runs counter to a preference for indices based on 'medical outcomes.' As Lomas, Barer and Stoddart (1985) suggest:

> ... the absence of adequate measures of health status and the largely physician composition of the panels making the need judgements promotes formulation of goals in terms of medical processes instead of health outcome (421).

Further, the use of this index is limited by the fact that it is based on specific census years that may, or may not, be congruent with other datasets.

Potential Years of Life Lost Index. The Potential Years of Life Lost (PYLL) concept is a measure of 'premature death,' a death defined as one that takes place before the age of 75, an age selected arbitrarily as the 'rough' life expectancy for the Canadian population (British Columbia, 1995b). Hence, the PYLL reflects the cumulative number of years of life that are lost when members of the population die before the age of 75. PYLLs are calculated based on mortality from external causes (such as accidents, suicides, and drugs), and deaths from various disease categories including both chronic and acute conditions.

The Potential Years of Life Lost Index (PYLLI) is the ratio of the observed PYLL to the expected PYLL for any given geographical area. A group of mortality events can be used to calculate a single PYLL value. Hence, local health areas that have a PYLLI greater than 1.00 would be considered to have a lower health status than expected and those with a PYLLI less than 1.00 would have a relatively higher health status than expected.

Since the PYLLI is based on death events, it has limitations as a health index since it does not take into account other indicators of health status such as low birth weight infants, pre-term births, teenage mothers, elderly gravidae, and caesarean births (British Columbia, 1996b). Further, the PYLLI does not usually include stillbirths and infant mortality, since such early premature mortality would have a profound impact on the index.

Standardised Mortality Ratios. The Standardised Mortality Ratio (SMR) is one of the most commonly used statistics in health status research (British Columbia, 1996b; British Columbia, 1995b; Fakhoury and Roos, 1996; Foster and Burr, 1994; Foster et al., 1994, Tataryn et al., 1994). SMRs are based on the actual numbers of mortality events but a weighting is not assigned to the events as in the case of the PYLL. Like the PYLLI, SMRs can be used to establish whether an area has a health status above or below the expected value of 1.00. The SMR can be a composite of a variety of death indicators resulting from diseases or external-causes.

The Health Status Index. In their report, *Screening for Health Area Benchmarks*, Foster et al. (1994) combined the SMR values for eight disease-related health status indicators with five lifestyle-related indicators and four birth-related indicators expressed

as ratios. The resulting ratio from the seventeen combined ratios was called the 'Mosaic of Health Status' (Foster et al., 1994). The index was calculated for each of the 79 LHAs in British Columbia and then compared LHAs to one another on quintile scales, one for each of the three related sub groupings and one for the total 'Mosaic of Health Status' value. The provincial mean was assigned the value of 1.00 and, as with PYLLIs and SMRs, values above this indicated lower (or worse) than expected health status and values below 1.00 were indicative of a higher (or better) health status.

The *Benchmarks* paper was innovative in that it took easily obtainable data from two separate domains, birth and death, and combined them into an index that the authors felt gave a broad perspective of the population health of each area analysed. Eight consecutive years of data were used to display reliable and valid measures, avoiding fluctuations that may have occurred in a single year (Foster et al., 1994).

It was also noted that the Mosaic of Health Status was not meant to explain variations in health status, but rather was intended to summarise the health status of a population on the basis of birth and death outcomes. The authors recognised that many other factors are associated with, and impact upon, population health. They recognised that the determinants of population health go beyond biological and medical models and encompass factors such as:

- social environment
- physical environment
- biological endowment
- individual responses
- productivity and wealth
- illness
- health care

Medical Services and the Health Status of Remote and Rural Populations

It is important not to confuse measures of 'supply of' and measures of 'need for' physicians. Lomas et al. (1985), in comparing physician stock to service requirements, stated:

> If there were some known and objective relationship between numbers of physicians and the health status of the population they serve this would be relatively straightforward ... unfortunately no such clear relationship exists (417).

Nevertheless, the many challenging socio-economic and environmental conditions that rural and remote residents face (Jennissen, 1992; British Columbia, 1995b) appear to be accompanied by both unfavourable health status and lack of access to health services. In a study of rural areas of Quebec, the 'most rural' areas were consistently found to have reduced health status compared with other 'less rural' areas. This discrepancy was attributed to both geographical and socio-economic differences (Pampalon, 1991).

The Northern and Rural Health Task Force, appointed in 1994 by the BC Minister of Health to determine the health needs of rural communities and to identify ways to address those needs, found that rural and remote residents "were generally worse off than urban residents" according to various population health indicators (British Columbia, 1995b). The Task Force observed that the remote and rural regions of BC had higher rates of income assistance, unemployment, and poor education than other regions in the Province (British Columbia, 1995b).

It was felt that social and economic factors contribute more to poor health status than the traditional determinants of health, such as biological influences, healthy behaviours and skills, and health services. Weller and Manga (1988) concurred, stating that lack of access and the non-availability of health services are at least equalled by the

effects of climate, unemployment, and lifestyle upon the health status of northern residents.

Aboriginal residents are more likely to have a further reduced level of health than the general population, as the socio-economic factors that remote and rural residents face are further compounded for these peoples. The regions where their numbers are highest show a significantly lower degree of health status (British Columbia, 1995b). Sarsfield (1988) highlights the changing pattern of health indicators of northern indigenous peoples stating that:

> ...the initial impact of infectious illness (is) now giving way to a new epidemic of equally lethal lifestyle and environmental pathology. We have 'progressed' from TB and starvation to suicide and malnutrition, from dehydration to drug abuse, and from dependency to self-destruction (122).

The quality of health care in rural areas is a major issue that directly involves the availability of medical services and has been targeted as an area for strategic development in rural British Columbia. The Task Force reported that, when residents of rural areas required medical services, they were often hampered by "geographic isolation, cultural barriers, and scarce professional assistance" (British Columbia, 1995b). These hardships may be compounded by a disproportionate need for support and specialised services. One study has shown that many specialty services in rural areas, especially surgery and anaesthesia, are being performed, out of necessity, by general practitioners (Chiasson and Roy, 1995). Although these physicians may have some training in surgery and/or anaesthesia, these findings suggest that the need for specialised services is not always met by certified specialists.

Further, given that there are many areas of rural British Columbia that have no medical services in their area, the Task Force recommended that family physicians be given special skills with which to work in rural communities and that improved recruitment programs be developed to improve locating physicians in areas of need (British Columbia, 1995b).

It is clear, however, that improving the supply of primary care physicians and specialists to remote, rural and northern regions does not have as direct an impact compared to the various socio-economic, cultural, and geographic factors that play such a leading role in determining the health status of populations. Indeed, the evidence with regard to the relationship between measures of need and the use of physician services is sometimes contradictory. Some studies show a correlation between the two (Black, Roos, and Burchill, 1994; Roos, Black, Wade and Decker, 1996), while others do not find this association (Tataryn et al., 1994; Pampalon, 1991). Certainly, the concept that reduced medical service provision leads to poorer health has been vigorously questioned in the literature (British Columbia, 1995b; Lomas et al., 1985; Mustard and Frank, 1992).

Nevertheless, although physician services per se may not have as great an influence on health status as many of the socio-economic, geographical and cultural factors that characterise the rural and remote areas of British Columbia, these services are still essential to those who are victims of the adverse effects of the other determinants of health.

In this thesis, the physician supply, the utilisation of physician services and the health status of the populations are highlighted for a Region of Northern British Columbia. While the empirical analysis will not answer the complex questions that

surround the relationship between physician services and population health status, it is hoped that the data will effectively describe the current situation in the Region and suggest avenues for further research.

Problem Statements

The background provided through the literature has helped determine the focus of analysis for this thesis. As a result of this review, four different objectives are framed and addressed using available datasets.

The problem statements are:

1. How many physician full time equivalents (general practitioners and medical specialists) are there in the LHAs of the Northwest Health Region, and how do these numbers compare to the levels in other LHAs, and in the Province as a whole?
2. What are the rates of utilisation and geographical accessibility to physician services in the LHAs of the Northwest Health Region, and how do they compare to the rates in other LHAs, and in the Province as a whole?
3. What is the level of population health status in the LHAs of the Northwest Health Region, and how does this compare to the level in other LHAs, and in the Province as a whole.
4. What is the relationship, if any, between the population health status and the utilisation of physician services in the Northwest Health Region.

CHAPTER 3

METHODS

This chapter describes the study design, the datasets selected for study, the method used to formulate the Health Status Index, the strategies for data analysis, and the limitations of the data.

Study Design

This study follows a descriptive design in that it describes the number of full time equivalent physicians who provide services in the Northwest Health Region; the rates, access to, and patterns of medical service provision in the Northwest Health Region; and the health status of the population of the Northwest Health Region. These indices of physician supply, utilisation of medical services, and health status are compared with the corresponding provincial values.

The study then proceeds to examine the relationship between health status and medical service utilisation for the Northwest Health Region population using correlations as a measure of association between variables, but without inferring a causal relationship. The present study views the utilisation of medical services as a factor that, on the one hand, may contribute to the enhancement of the health status of a population while, on the other, the level of health status may determine the level and pattern of medical services sought by a specific population.

Sources of Data

This study is based on data obtained from the BC Ministry of Health. Much of the data exists in published, aggregated, and accessible form. In some cases, access was provided to datasets for specific and detailed analyses. Two datasets were obtained and

utilised. These datasets will be referred to as the Medical Resource Utilisation Dataset and the Vital Statistics Dataset.

Medical Resource Utilisation Dataset. This dataset is based on billings submitted by physicians to the BC Medical Services Plan and includes information on all medical services billed under fee-for-service arrangements for each of the 79 LHAs in British Columbia. Data for 1992/93, 1993/94 and 1994/95 were provided by the BC Ministry of Health, Program Monitoring and Information Management Branch. The dataset provides information aggregated at the Local Health Area, Regional, and provincial levels. The dataset includes the following variables:

- *Local Health Area* is the smallest geographical unit to which the data is aggregated. It usually comprises an area comparable in size to a school district. Services provided to the population that resides in the area are attributed to that LHA, regardless of where the services were rendered

- *Total population* is defined as the population of the LHA based on the BC Ministry of Government Services P.E.O.P.L.E population model datasets for 1992/93, 1993/94 and 1994/95

- *Total number of patients* describes the number of people that received at least one medical service billed to MSP by a physician during the year analysed

- *Medical Practitioner numbers* represent the distinct number of medical practitioners who rendered at least one service during the year analysed within the local health area

- *Practitioner full time equivalents* are based on the Health Canada definition of a physician FTE. This definition is used by the BC Ministry of Health and others to define an amount of work by a physician that is considered 'full time.' A fraction of an FTE is, therefore, less than 'full time' but does indicate services that were rendered by a physician (see Appendix 2 for detailed formula)

- *Crude number of medical services* is the total number of medical services provided for each LHA. A service is defined as any medical procedure performed by a physician and billed to MSP using a fee item. A fee item is a numeric code used to identify each type of service rendered by a practitioner

- *Crude payments* are the payments by MSP for medical services provided. The payments are based on the fee that is associated with the various services provided by medical practitioners The BC Medical Services Commission approves the fee items and their corresponding fees. The figures include Northern and Isolation Allowances, interest amounts and 'rollbacks'

- *Standardised medical services per 1000 population* is the age-adjusted rate of medical services provided

- *Standardised payments per 1000 population* is the age-adjusted rate of all crude payments for medical services rendered

- *Percentage of medical services provided to population of LHA within the LHA*

- *Percentage of medical services provided to population of the LHA within the Region*

- *Percentage of medical services provided to population of the LHA within Region but outside the LHA*

- *Percentage of medical services provided to population of the LHA in Vancouver*

- *Percentage of medical services provided to population of the LHA elsewhere in BC*

The medical services in the above categories includes those provided by general practitioners, medical specialists, and diagnostic specialists. The specialties that make up each classification defined by the BC Medical Services Plan are shown in Appendix 1.

Vital Statistics Dataset. The best data to determine health measures of local areas for comparison is that which measures broad population health outcomes (Foster et al., 1994):

> ... among all the information available in the Ministry of Health data bases, information from the [Division of] Vital Statistics birth and death files is [the] most comprehensive, and therefore can be said to be population based (after Hertzman, Ostry and Heacock, 1991).

Comprehensive mortality, birth-related and morbidity data are gathered routinely by the Ministry of Health, Division of Vital Statistics and are then published in two forms. Constantly updated data are presented quarterly in the Quarterly Digest while selected yearly data appear in the Annual Report. The data used in this study came from the 1995 Annual Report (see British Columbia, 1996b) and were supplemented by analysis of computer files received directly from the Division of Vital Statistics. Two types of indices that were either available in the published reports or could be calculated from available data were used.

A *Standardised Mortality Ratio* (SMR) is the "ratio of the number of deaths occurring to residents of a geographic area (e.g., LHA) to the expected number of deaths in that area based on provincial age-specific mortality rates" (British Columbia, 1996b, 127). A majority of the SMRs that were used in the present study were taken directly from the Annual Report (British Columbia, 1996b, Appendix 3 [173-4]) while indices that were not published in the Report were obtained directly from the Division of Vital Statistics.

A *Birth Related Ratio* (BRR) is not a commonly used index and is not routinely reported as an index of birth events. Nevertheless, it can be calculated using the same methodology as SMRs. The various birth event rates reported in the 1995 Annual Report, therefore, were converted to Birth Related Ratios by dividing the LHA rate by the provincial rate (British Columbia, 1996b). The actual ratios were later obtained directly from the Division of Vital Statistics confirming the original calculations.

Standardised Mortality Ratios (SMRs) and Birth Related Ratios (BRRs) were aggregated for the five year period 1991 to 1995. Five years were chosen since this is the

standard time period used by the Ministry of Health for analysis of trends in mortality and health status (British Columbia, 1996b). The 1991-1995 period was selected to allow for comparative analyses with the Medical Service Utilisation dataset, whose time-frame spanned the years 1992 to 1995.

Formulation of the Health Status Index

The concept of a Health Status Index for British Columbia was initially formulated by Foster et al. (1994). Their paper, *Screening for Health Area Benchmarks in British Columbia*, took mortality data and created a 'Mosaic of Health Status' for each Local Health Area in BC. The Mosaic was based on seventeen different indicators in three different categories: Death Events (eight indicators), Life Style Events (five indicators) and Birth Events (four indicators). Each Death Events and Lifestyle Events indicator was a 'composite' SMR that was based on one or more mortality events as defined by the ICD-9[2] method. Birth Events indicators were made up of BRRs based on conditions related to childbirth.

Three categories of health status were derived from the ratios: a Mosaic of Death, a Mosaic of Life Style, and a Mosaic of Birth (Table 3.1). These are presented separately to show the contribution that each Mosaic made to the overall level of health in the LHAs. Finally, all seventeen indicators were subsequently combined to achieve a total Mosaic of Health Status.

[2] ICD-9 stands for International Classification of Disease of the Ninth Revision Conference. This system classifies each separate disease or incident as an individual number for ease of reporting and for use in research. For example: Ischemic Heart Disease is classified as ICD-9 codes 410 to 414 while mortality from External Causes includes ICD-9 codes E800 - E999.

Table 3.1: Constituents of "Mosaic of Health Status" by Foster et al. (1994)

Mosaic:	Indicator:	Type:	ICD-9 Code(s):
Disease	1: Diseases of the Heart	SMR	390-398, 402, 404, 410-429
	2: Cerebrovascular Diseases	SMR	430-434, 436-438
	3: Diseases of the Arteries	SMR	440-448
	4: All Cancer Sites	SMR	140-208, excluding 162
	5: Lung Cancer	SMR	162
	6: Pneumonia and Influenza	SMR	480-487
	7: Chronic Lung Disease	SMR	491, 492, 496
	8: Digestive System	SMR	520-579
Lifestyle	9: Deaths from External Causes	SMR	E800-E999
	10: Alcohol-Related Deaths	SMR	291, 303, 305.0, 357.5, 425.5, 535.3, 571, 577.1, 648.4, 760.7, 790.3, E860
	11: Medically Treatable Deaths	SMR	401-405, 180, 481-486, 490, 010-018, 137, 493, 393-398, 460-466, 487, 001-005,020-041, 320, 382, 383, 390-392, 680-686, 711,730, 201, 540-543, 550-553, 574, 575, 280, 281
	12: Estimated Smoking-Related Deaths	SMR	140-149, 150, 157, 161, 162, 180, 188, 189, 401-404, 410-414, 390-398, 415-417, 420-429, 430-438, 440, 441, 442-448,493, 480-487, 491-492, 496, 010-012
	13: Drug Induced Deaths	SMR	292, 304, 305.2-305.9, E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5
Birth	14: Infant Mortality	Ratio	
	15: Low Birth Weight Births	Ratio	
	16: Pre-term Births	Ratio	
	17: Teenage Mothers	Ratio	

note: The total "Mosaic of Health Status" is determined from the mean of all 17 indicators.

This method for developing a health status index has been replicated in the present study but uses current mortality data and fifteen indicators instead of the seventeen used by Foster et al. (1994). 'Estimated Smoking-Related Mortality' was excluded because the death events used by Foster et al. (1994) to create this indicator

were included within six other indicators. This resulted in a double weighting of these SMRs in the Mosaics.

Lung cancer mortality was excluded from the present study because this cause-specific mortality could not be obtained at the LHA level without costly special data runs by the Division of Vital Statistics and was, therefore, integrated in the indicator 'All Cancers.'

Following Foster et al. (1994), the fifteen ratios were classified into three different categories: Disease Index, Lifestyle Index and Birth-related Index. Seven ratios contributed to the Disease Index while four ratios contributed to each of the Lifestyle Index and the Birth-related Index (Table 3.2).

A 'Total Health Status Index' (THSI) was derived by weighting each of the fifteen SMR values equally and then calculating the mean for each LHA. The THSI values for all 79 LHAs were ranked in order and grouped in quartiles. The LHAs that comprised the Northwest Health Region were then identified separately in order to compare their overall health status with other LHAs in the Province.

For the purpose of this study the term 'Total Health Status Index' is used rather than 'Mosaic of Health Status.' As well, the 'Mosaics' of Disease, Lifestyle and Birth have been replaced by the Disease Index, the Lifestyle Index, and the Birth Index respectively. This helps to avoid confusion between the two measures and acknowledges the differences that exist between the indices used by Foster et al. (1994) and those used in this study.

Table 3.2: Constituents of "Health Status Index"

Index:	Indicator:	Type:	ICD-9 Code(s):
Disease	1: Diseases of the Heart	SMR	390-398, 402, 404, 410-429
	2: Cerebrovascular Diseases	SMR	430-434, 436-438
	3: Diseases of the Arteries	SMR	440-448
	4: All Cancer Sites	SMR	140-208
	5: Pneumonia and Influenza	SMR	480-487
	6: Chronic Lung Disease	SMR	491, 492, 496
	7: Digestive System	SMR	520-579
Lifestyle	8: Deaths from External Causes	SMR	E800-E999
	9: Alcohol-Related Deaths	SMR	291, 303, 305.0, 357.5, 425.5, 535.3, 571, 577.1, 648.4, 760.7, 790.3, E860
	10: Medically Treatable Deaths	SMR	401-405, 180, 481-486, 490, 010-018, 137, 493, 393-398, 460-466, 487, 001-005,020-041, 320, 382, 383, 390-392, 680-686, 711,730, 201, 540-543, 550-553, 574, 575, 280, 281
	11: Drug Induced Deaths	SMR	292, 304, 305.2-305.9, E850-E858, E950.0-E950.5, E962.0, E980.0-E980.5
Birth	12: Infant Mortality	Ratio	
	13: Low Birth Weight Live Births	Ratio	
	14: Pre-term Births	Ratio	
	15: Teenage Mothers	Ratio	

note: The total "Health Status Index " is determined from the mean of all 15 indicators.

Limitations of the Data

The data used in this study are subject to limitations that may affect the reliability, validity and robustness of the analysis and the interpretation of the results.

Quality of Vital Statistics Data. The data originated from secondary sources and as such, the weaknesses that exist in the original collection and analysis of the primary data are reflected in these datasets. Nevertheless, the BC Ministry of Health has established rigorous procedures and definitions for collecting the data and inconsistencies

are noted and discussed in the source documents (British Columbia, 1996b). The Vital Statistics datasets have a reputation of being of high quality and are readily accessible to the researcher (Foster et al., 1994). However, Foster and Burr (1994) discovered that there were significant differences in mortality data for LHAs along the Alberta border due to the non-reporting of mortality that occurred in the different provincial jurisdiction.

In the present study, LHA 87 (Stikine), which borders on the Yukon Territory, could be subject to the same concern but an examination of the data suggested that mortality appears to be attributed to that LHA appropriately and it has been included in the analysis of the Health Status Indices. However, the medical services utilisation data for this area was an extreme outlier for virtually all values. As a result, it was decided to exclude the Stikine LHA from utilisation analysis.

Time Frame of Datasets. The time frame of data collection may be a limitation in this study. The Vital Statistics dataset is based on a moving five year aggregation that is regularly employed by the Ministry of Health to discern trends in mortality. The five year period is used so that anomalies that may occur in a single year do not influence the SMRs for relatively small geographical units.

The Medical Resource Utilisation dataset was based on only three consecutive reporting years but visual inspection of the annualised data suggested that there was little variability in the variables from year to year. Nevertheless, the addition of one or two physicians to the existing complement of practitioners in a small geographical area could cause significant variance in a single year. Although a longer period may have provided a more stable estimate of the medical service indicators, the utilisation indices were considered to be reliable for the purposes of this study. In addition, attempting to evaluate

a larger number of years may have presented a problem, since the volume of data to be manipulated was significant and additional years would have created analytical problems.

Coverage of Medical Services Utilisation. The Medical Resource Utilisation database was obtained from data compiled by the Medical Services Plan. The information originates from physician billings to the Plan and, as a result, only those physicians registered to bill through MSP are included. This means that LHAs may receive medical services that are not recorded under the Medical Services Plan. These exclusions are as follows:

- Out-of-province care provided to BC residents, even though claims by other provinces may have been rendered and processed by the Ministry
- Services provided by physicians working under contract with the Alternative Payments Branch. These may include various salaried arrangements in clinics, sessional appointments, and other forms of practice
- Medical services provided to First Nations bands by arrangements with the Medical Services Branch, Health Canada

While the number of physicians that are excluded is quite small, since most physicians practising in British Columbia bill for their services through MSP, this limitation becomes important in the smaller and rural areas where the alternative contracting of physician services is more prevalent. For example, the Nishga LHA has a health centre with one or two physicians on staff at any one time. Since the health centre is funded by the Medical Services Branch of Health Canada, the services rendered by these physicians are not recorded by the MSP and will not appear in the dataset used in this study. Since the Nishga also utilise medical services in Terrace, Vancouver and other centres, a utilisation rate for this LHA appears in the dataset. Nevertheless, where such

alternative arrangements exist the medical services used by an LHA are underestimated. Such anomalies will be identified in the results and subsequent discussion.

Medical Diagnostic Services. The Medical Resource Utilisation dataset provided data on three groups of physicians defined by the MSP, i.e., general practitioners, medical specialists and diagnostic specialists. This study examines the provision of medical services by only general practitioners and medical specialists. Services provided by diagnostic specialists defined by MSP as Pathology, Radiology, Nuclear Medicine, and Medical Microbiology were not included in this study. The major reason for the exclusion was the fact that, during the period of study, the small number of laboratory specialists in the Region, and in the individual LHAs, rendered an analysis of laboratory physician supply and distribution in the Region impossible. Since medical diagnostic services are provided only upon referral from other physicians, it was felt that access to these services would be partly reflected in the utilisation of general practitioners and specialists. It seemed that the issue of access to laboratory services would not be adequately addressed by their inclusion in the present study and that, indeed, the access and use of laboratory services merited a detailed study in its own right.

Limitations in the Health Status Index

There are two possible limitations resulting from the formulation of the health status indices. First, since the Total Health Status Index is composed of 15 indicators, there is a distinct possibility that a single high mortality ratio may be obscured in the final THSI value. For example, an LHA may have a low overall THSI value (indicating a high level of health status) but have one or more very high SMRs. Since each indicator only contributes 1/15 of the Index total, large values may be buried in the overall score.

However, the concept of an overall indication of population health is integral to this study and the utilisation of the Total Health Status Index as a screening method for the tempering of outlying ratio values is intended and desirable.

The other limitation of the Total Health Status Index is the fact that two indicators used by Foster et al. (1994), 'Estimated Smoking-Related Mortality' and 'Lung Cancer,' were excluded. As discussed earlier, all of the smoking-related events coded by ICD-9 are duplicated within other indicators, therefore, the exclusion of this factor avoids the double weighting of events. The merging of lung cancer mortality within the 'All Cancers' category, rather than as an independent indicator, should not have affected the outcome of the Total Health Status Index. Lung cancers made up 26.8% of all cancer deaths between 1991 and 1995, indicating its importance as a separate variable (British Columbia, 1996b). Nonetheless, it has not been excluded from this study, but is integrated within the 'All Cancers.' This allows mortality from lung cancer to be included but with a lesser weighting in the Total Health Status Index value. This combining of indicators should not have had a significant outcome on the Total Health Status Index as the adjustment should have a relatively equal impact on all LHAs.

Data Analysis

This study has an exploratory and descriptive focus which is reflected in the choice of analysis methods. Given the high number of physician FTEs and related services in the large urban regions, the median was adopted as a measure of central tendency in order to temper the outlying values associated with the rates in those areas. The various rates of physician supply and medical services utilisation were compared with the provincial median and quartile ranges. Results were graphed for ease of analysis,

plotting each variable against each Northwest LHA. The BC median, first and third quartile are clearly indicated.

Pearson correlational coefficients were employed to detect any association between the subset of variables derived from each dataset. The choice of variables was determined by the preliminary analysis for first order relationships. Those variables that were found to be unconfounded by other variables within the Medical Resource Utilisation dataset were used in the correlational comparison with health status. Outcomes of the analysis indicate the correlation of variable pairs and the strength of the association. The significance level of $p \leq 0.05$ was set as the minimum level of statistical significance.

CHAPTER 4

RESULTS AND DISCUSSION: PHYSICIAN COUNTS IN THE NORTHWEST HEALTH REGION

This thesis examines four different problem statements related to medical resource utilisation and health status in the Northwest Health Region of British Columbia. The results presented in this chapter deal specifically with problem statement 1, as proposed in chapter 2. This problem statement inquired:

> How many physician full time equivalents (general practitioners and medical specialists) are there in the LHAs of the Northwest Health Region, and how do these numbers compare to the levels in other LHAs, and in the Province as a whole?

The number of physicians was originally determined by the 'head count' of physicians practising in the Northwest Health Region. However, because of the differences in physician patterns-of-practice, it is inappropriate to use head counts to measure the relative contribution each physician makes (Young, 1996). Since head counts do not accurately portray the degree to which physicians provide services, full time equivalents (FTEs) are used in this study instead. These values, based on the Health Canada FTE definition (Appendix 2), give a more accurate indication of the number of physicians working 'full time' to provide medical services.

Further, the number of physicians, whether expressed in head counts or in FTE terms, does not take into account the size of the population it serves. Therefore, for the purposes of this study, the physician supply was also expressed using a ratio of population to physician FTEs for each LHA.

Physician Full Time Equivalents

Figures 4.1 and 4.2 display the mean three year full time equivalents of general practitioners in the Northwest Health Region. Figure 4.1 depicts FTE values that are unadjusted for the population of the LHA, while Figure 4.2 shows supply based on a ratio of population to physician FTEs. Figures 4.3 and 4.4 give this same information for the medical specialists of the Northwest Health Region.

The physician supply rates for the LHAs of the Northwest Health Region are compared to the BC median and an interquartile range.

General Practitioners.

Figure 4.1 indicates that two of the seven Northwest LHAs (Prince Rupert[3] and Terrace) had more general practitioner FTEs than the provincial median and that two more (Smithers and Kitimat) were above the first quartile and approaching the median. These four LHAs were within the interquartile range for physician FTEs. The other three LHAs (Queen Charlotte, Nishga and Telegraph Creek) were below this range.

[3] For the sake of convenience, each local health area will be referred to simply by its name rather than identifying it as an LHA every time. Thus the 'Smithers LHA' will be just be called 'Smithers.' This should not cause confusion with the actual community names since they will be identified as 'communities' whenever they are mentioned.

Figure 4.1: General Practitioner FTEs, 1992-95

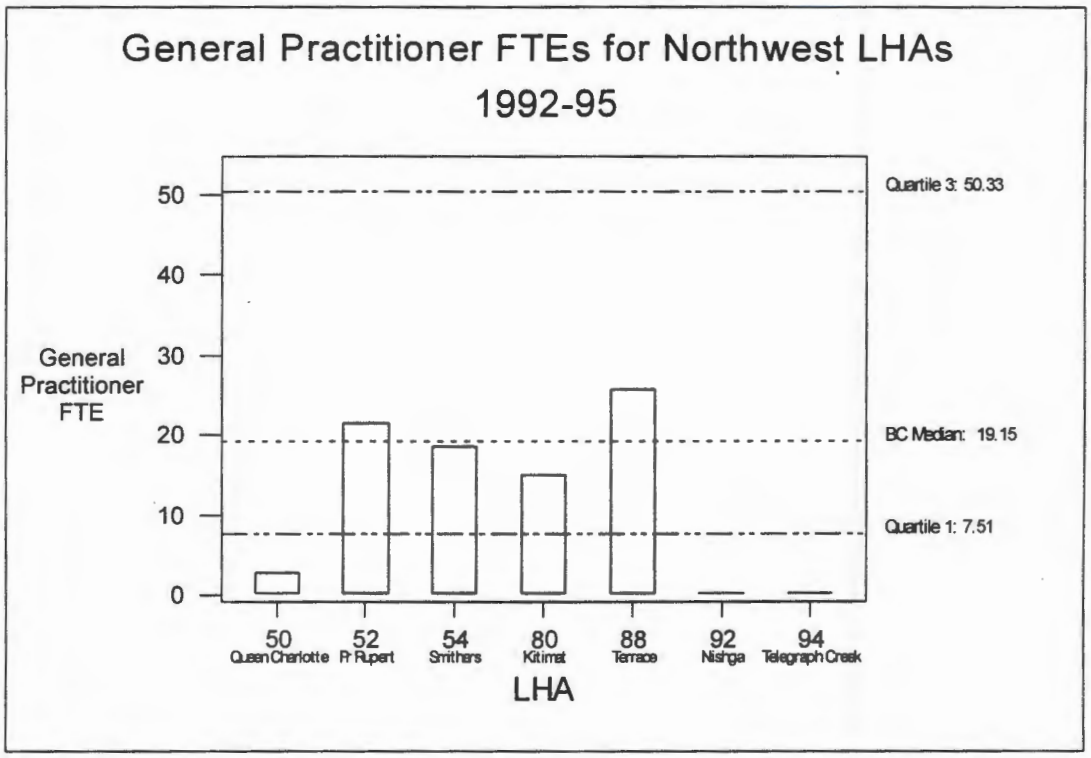
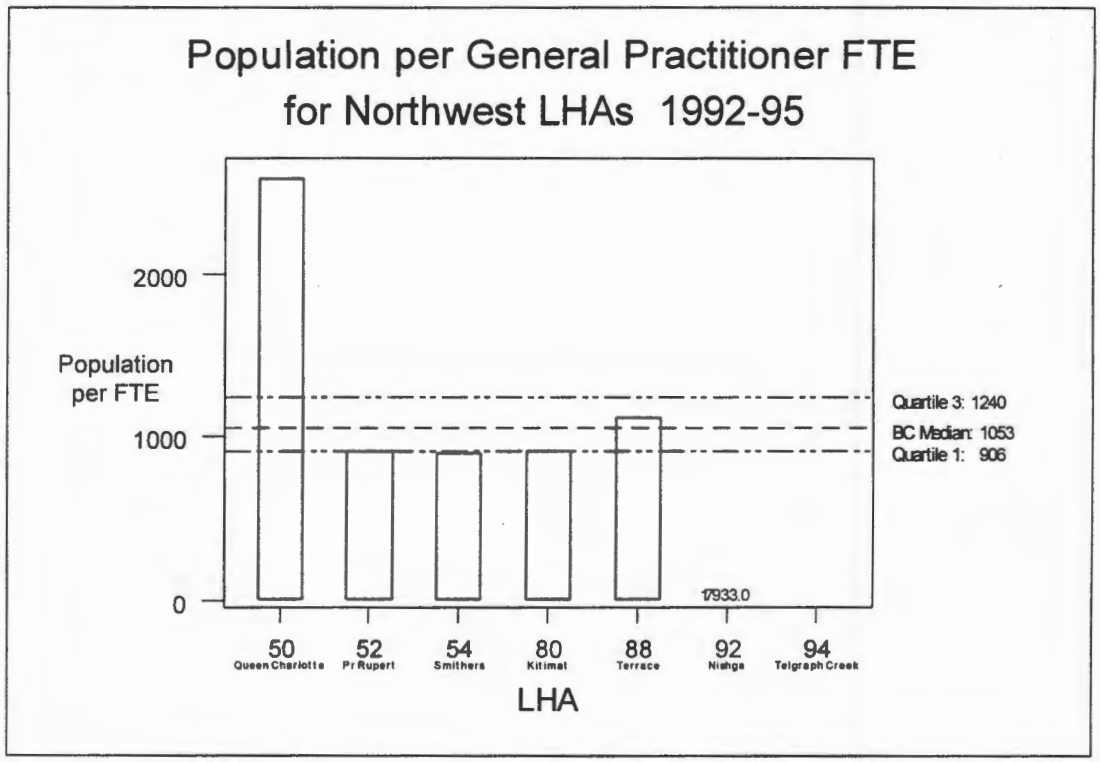


Figure 4.2 utilises the ratio of population to physician FTEs. Prince Rupert, Smithers and Kitimat all show slightly lower population/physician FTE ratios than the interquartile range, indicating that they had fewer residents per physician FTE than 75% of the LHAs in British Columbia. Terrace is also within this range, just above the median value for the Province. As in Figure 4.1, Queen Charlotte, Nishga and Telegraph Creek are well out of this range, with Queen Charlotte having twice the population per general practitioner FTE than the provincial median. The value for Nishga is not displayed in Figure 4.2 as the very high ratio value (17933) was impossible to scale in the figure. The value is displayed above the LHA 92 label.

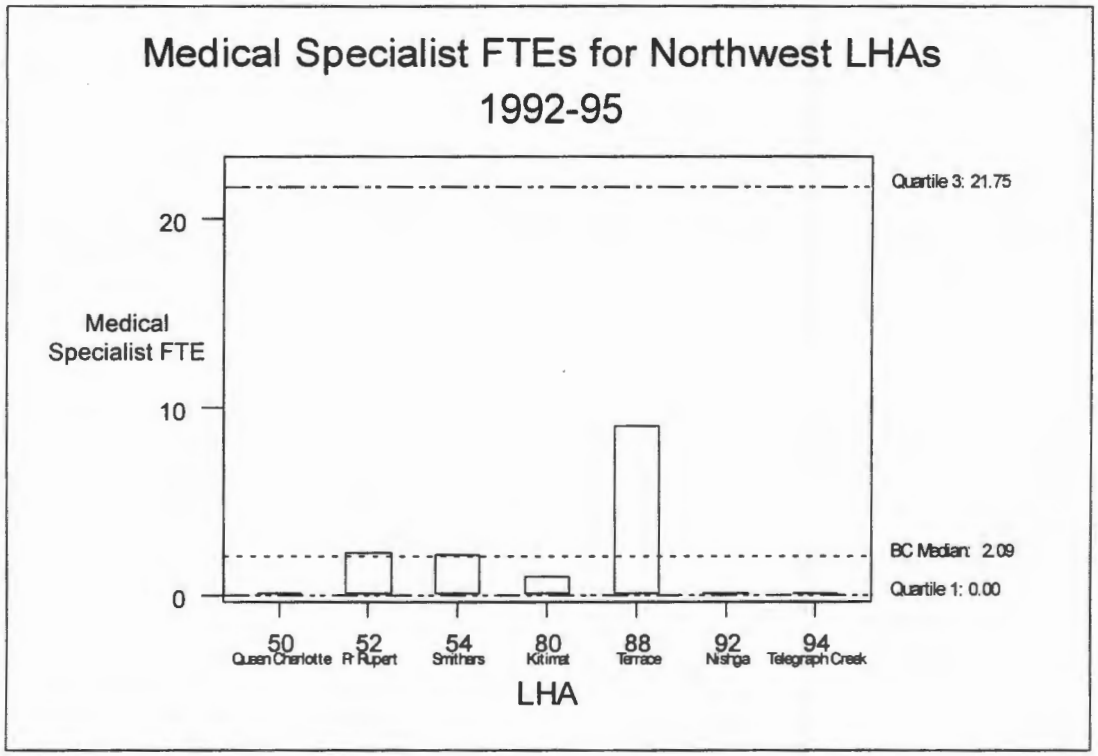
Figure 4.2: Population per General Practitioner FTE, 1992-95



Medical Specialists.

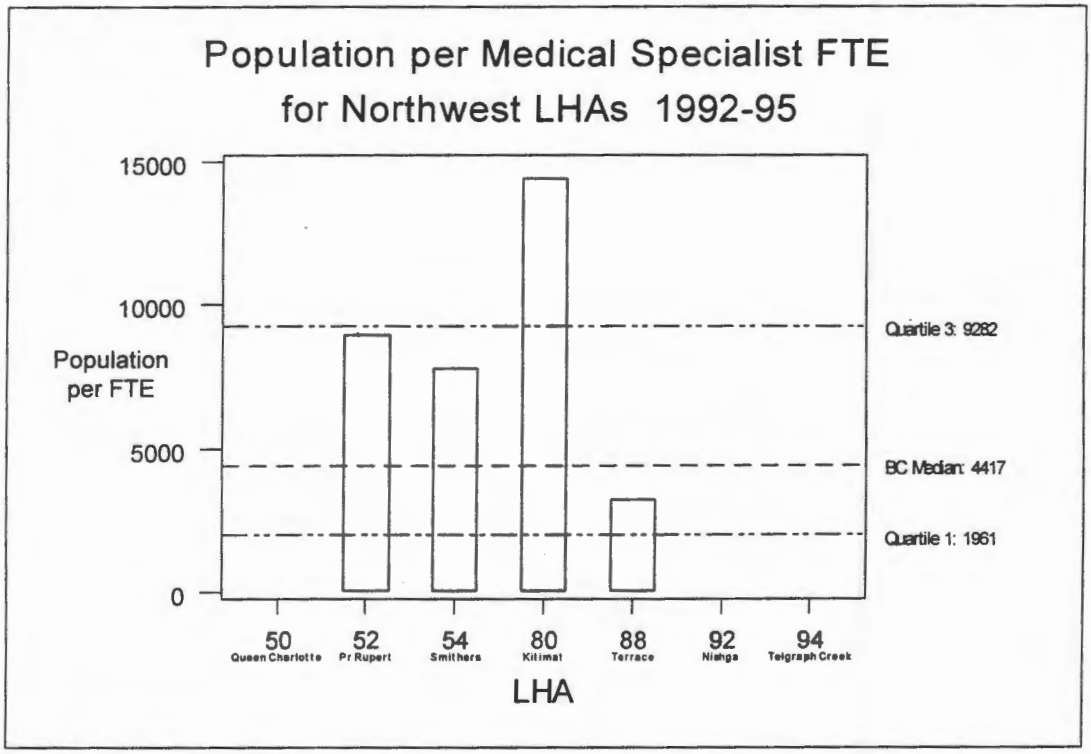
In Figure 4.3, three LHAs (Prince Rupert, Smithers and Terrace) exceeded the provincial median for medical specialist FTEs and one other (Kitimat) had a value somewhat greater than the first quartile. Since the first quartile for Figure 4.3 had a value of 0.00, it can be seen that all of the LHAs fell within the interquartile range, even those with no medical specialist FTEs.

Figure 4.3: Medical Specialist FTEs, 1992-95



An easier interpretation can be made using Figure 4.4. Terrace showed a value below the median for the population/physician FTE ratio, while Prince Rupert and Smithers had values within the interquartile range. Kitimat had a value much higher than the interquartile range. Queen Charlotte, Nishga and Telegraph Creek had no ratio value as they had no medical specialist FTEs.

Figure 4.4: Population per Medical Specialist, 1992-95



The figures would indicate that four LHAs in particular, Prince Rupert, Smithers, Kitimat, and Terrace, had levels of general practitioner full time equivalents within the interquartile range based on absolute FTE values. The levels for these four LHAs were within or lower (and thus, better) than the interquartile range for the population/physician ratio. The absolute and ratio values for medical specialists were also within the interquartile range for these LHAs, with the exception of the medical specialist population/physician ratio for Kitimat.

Conversely, three of the LHAs, Queen Charlotte, Nishga, and Telegraph Creek, were well outside of the interquartile range in all figures, except for Figure 4.3 where the first quartile was zero, due to small FTE counts in these LHAs.

Discussion of Physician Full Time Equivalents

Given the intrinsic problem of determining how many physicians are needed to serve a given population, it was decided to use the interquartile[4] range to define a 'reasonable' supply of physicians. For example, a high population/physician ratio in the first and fourth quartile would not be considered reasonable, whereas a value in the interquartile range would be. LHAs outside of this range can be considered outliers, and whether such outliers are for the better or worse depends upon the variable being described and the direction of deviation.

General Practitioners. There seems to be a wide discrepancy between the general practitioner supply in the various LHAs in the Northwest Health Region. Prince Rupert, Smithers, Kitimat and Terrace all had a reasonable number of physician FTEs while Queen Charlotte, Nishga and Telegraph Creek did not meet the criterion of reasonable with no practitioners in the latter two LHAs.

As mentioned in the methods chapter, this study uses physician utilisation data derived solely from sources at the provincial Medical Services Plan (MSP). This becomes very important when dealing with LHAs that have alternate payment schemes for physician services. In fact, at the time of the study, two of the three LHAs that were lacking in MSP physicians, namely, Queen Charlotte and Nishga, were known to have physicians working under alternative arrangements. Queen Charlotte had six additional full time physicians in two centres, three in Queen Charlotte City and three in Masset, all

[4] The interquartile range is a statistical measure that encompasses the area between the 25th and 75th percentiles of a range of variables. The median (rather than the mean) serves as the midpoint, while the 25th and 75th percentiles are referred to as the first and third quartiles (Q1 and Q3).

of whom were remunerated (and therefore counted) by arrangements other than billings to MSP (Lake, personal communication, 1997).

Nishga also had alternative arrangements with physicians to provide full time primary medical care in their area. Two physicians were contracted to provide services through Health Canada's Medical Services Branch in the Health Centre (Newbery, personal communication, 1997). It should also be noted that there also were physicians working under contract in some of the areas that had MSP physicians, including seven in Hazelton and two in Stewart, both of which are in the Terrace LHA.

If all of these physician numbers are taken into consideration, the physician supply in the Northwest is clearly underestimated when based on data from the Medical Services Plan. Since contracted physicians are counted using 'sessional'[5] units rather than FTEs these physicians cannot be incorporated with validity into the MSP database. However, if each sessional physician was theorised to provide one FTE each, then the number of physicians and related ratios would improve substantially. At face value it can be stated that the Northwest Health Region has, by definition, at least a reasonable supply of primary care physicians. This is particularly important to consider when turning attention to medical specialist numbers and ratios in the Northwest.

Medical Specialists. Based on Figure 4.3, at least 25% of the LHAs in British Columbia did not have a medical specialist of any kind practising in their LHA. Therefore, the fact that three of the seven LHAs in the Northwest did not have any

[5] The sessional unit describes a certain number of service hours per week performed by a physician under contract to the Ministry of Health Alternative Payments Branch or the Health Canada Medical Services Branch. Since FTEs are based on a payment formula derived from MSP earnings rather than one based on hours of services, the two are difficult to equate.

medical specialists is not surprising, considering that each of these LHAs has a relatively small population base. Unlike the general practitioner category, this study did not identify any additional specialists working in the Northwest under an alternative payment system during the study period. However it does appear that, on the basis of MSP data alone, Prince Rupert, Smithers, Kitimat and Terrace had a reasonable number of specialists. Based on the population/physician ratio values, it can be seen that Kitimat drops below the reasonable criterion but Prince Rupert, Smithers and Terrace remain in the reasonable category.

It was stated by Horne (1986) that some degree of inequality between general practitioner and medical specialist numbers is "both inevitable and efficient." It can be argued here, on that point, that the lack of medical specialists in some of the Northwest LHAs is not a 'problem' that requires fixing. What may be a concern is whether or not the number of services rendered to the residents of these LHAs by medical specialists (within other LHAs) is adequate to meet the residents' expectations of a reasonable level of specialist services. The referral of patients to medical specialists in other LHAs may well be adequate to meet these needs. Such issues of access, for both practitioner types, are examined in the following chapter.

CHAPTER 5

RESULTS AND DISCUSSION: UTILISATION OF PHYSICIAN SERVICES IN THE NORTHWEST HEALTH REGION

This chapter will present the results that relate specifically to problem statement two as stated in Chapter 2:

> What are the rates of utilisation and geographical accessibility to physician services in the LHAs of the Northwest Health Region, and how do they compare to the rates in other LHAs, and in the Province as a whole?

The issue of 'accessibility' to medical services is important when dealing with remote and rural LHAs, since these areas are traditionally perceived to be underserved by physicians of all specialties.

The first part of this chapter will focus on the utilisation rate of medical services per 1000 population for each LHA in the Northwest Health Region. This analysis of 'services per 1000' describes the quantity, in terms of numbers, of medical services that were obtained by the population.[6] The utilisation data do not reflect the ability of populations to obtain medical services when needed nor do they address the accessibility of those services.

The second part of this chapter examines the accessibility in geographical terms by describing where medical services are obtained by the populations of Northwest LHA, whether in their own LHA, in the Region, in Vancouver, or elsewhere.[7]

Medical Services Utilised per 1000 Population

Figures 5.1 and 5.2 show the medical services provided per 1000 population in the

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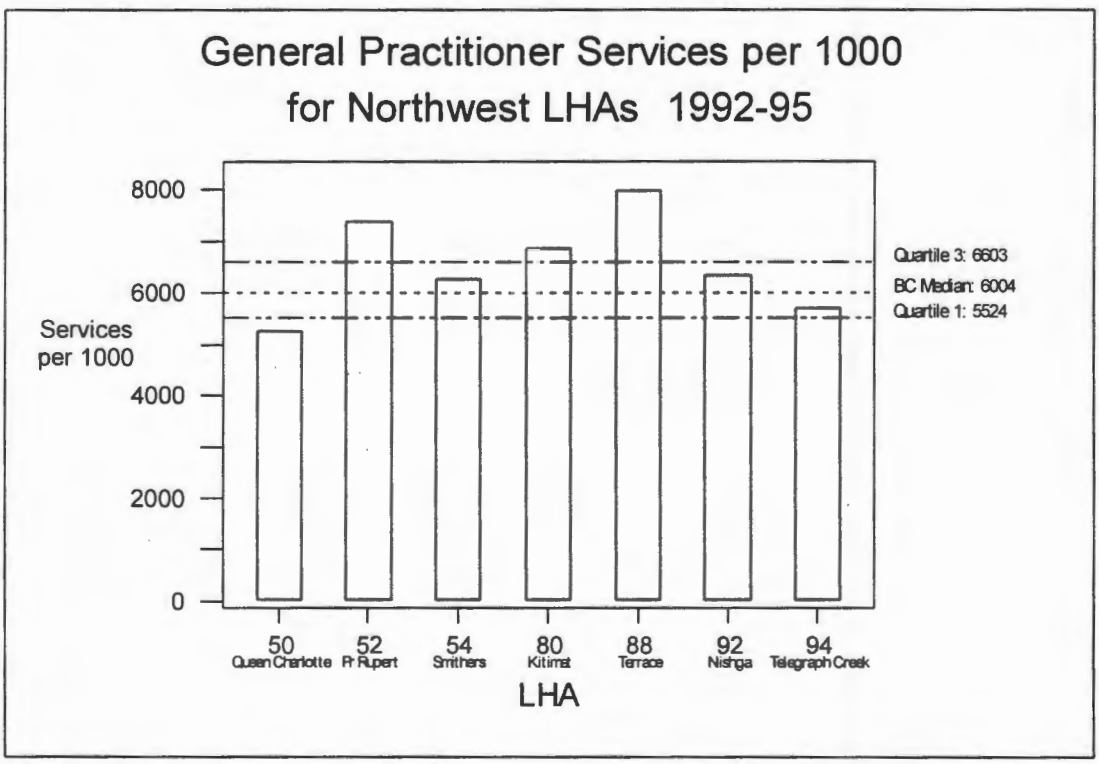
[6] See definition in Methods chapter.

[7] In this study, 'Elsewhere' is defined as any region other than the Northwest or the Vancouver Health Regions.

Northwest Health Region. In these figures, the medical services utilised in each LHA are compared using the provincial median and interquartile ranges as the baselines.

General Practitioner Services per 1000. Figure 5.1 demonstrates that five of the Northwest local health areas (Prince Rupert, Smithers, Kitimat, Terrace and Nishga) obtained more general practitioner services per 1000 than the provincial median. Prince Rupert, Kitimat and Terrace, in fact, exceeded the interquartile range of service provision. Telegraph Creek was below the provincial median but was still within the interquartile range. Only Queen Charlotte received a level of general practitioner services that fell below the interquartile range.

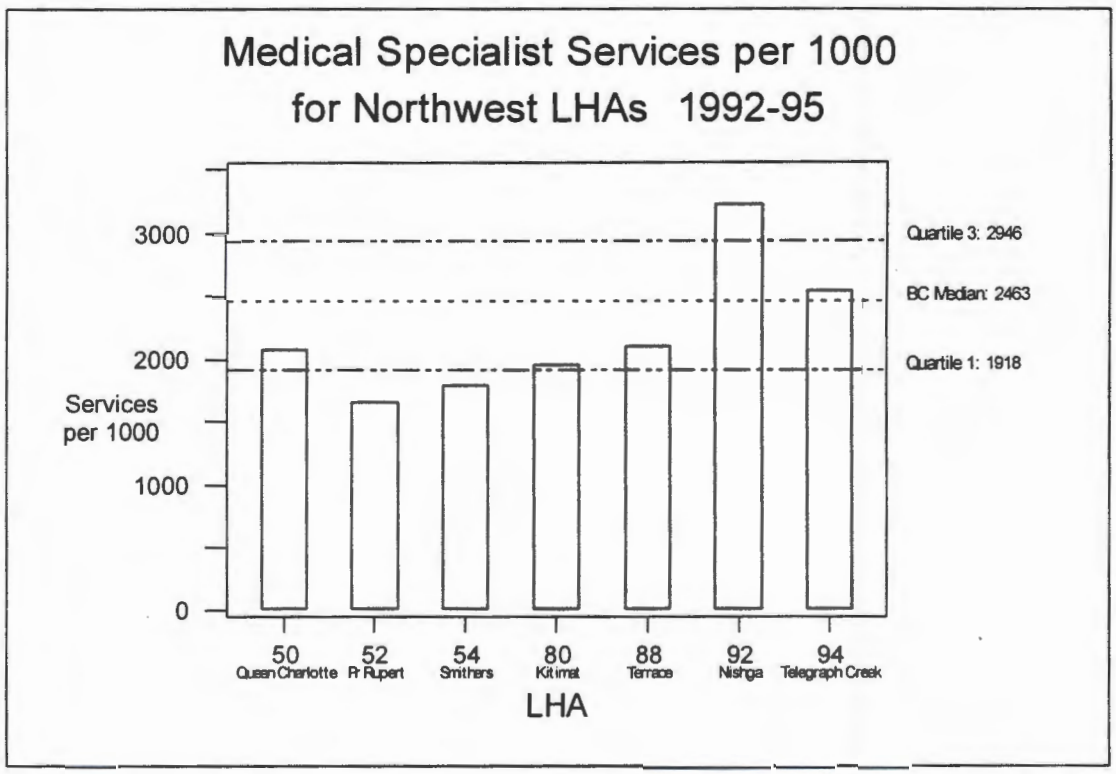
Figure 5.1: General Practitioner Services per 1000, 1992-95



Medical Specialist Services per 1000. Figure 5.2 indicates that Nishga received a higher level of medical specialist services than other Northwest LHAs. In terms of a

provincial comparison, the population of Nishga received more specialist services per 1000 than 75% of all other provincial LHAs. The utilisation of medical specialist services of four other LHAs (Queen Charlotte, Kitimat, Terrace and Telegraph Creek) fell within the interquartile range. However, both Prince Rupert and Smithers utilised fewer specialist services per 1000 population, falling below the interquartile range.

Figure 5.2: Medical Specialist Services per 1000, 1992-95



Discussion of Medical Services Utilisation per 1000

The rates of utilisation shown in Figures 5.1 and 5.2 do not suggest that there is a lower utilisation of physician services in the Northwest Health Region compared to provincial values. Nevertheless, the patterns of utilisation of general practitioner and specialist services are somewhat different and merit separate discussion.

General Practitioner Services. Overall, measures of access to general practitioner services are, arguably, the most important indicators of physician utilisation since they are measures of the ability of residents to obtain initial contact with a physician. As the primary care giver, the general practitioner is the 'gatekeeper' who enables patients to progress through the medical system, providing referrals to medical and diagnostic specialists.

The Prince Rupert, Kitimat and Terrace LHAs had general practitioner utilisation levels that exceeded the interquartile range. There are various possible explanations for these high levels of general practitioner utilisation. First, there may be an increased degree of 'medical' need for general practitioner services. Secondly, a high use of general practitioners may be partly 'set off' by a lower rate of utilisation of specialist services, an interpretation that is partially supported by the fact that all three of these LHAs utilised fewer medical specialist services than the provincial median. Thirdly, the level of general practitioner utilisation may also indicate the concentration of the physicians in specific LHAs. Fourthly, the levels of utilisation may reflect the specific patterns of practice of the general practitioners themselves.

Two of the three LHAs that did not have resident general practitioner FTEs (Nishga and Telegraph Creek) obtained a reasonable number of services compared to the provincial values. In addition to the services that it received from MSP practitioners, Nishga would also have received services from non-MSP physicians, suggesting that its total general practitioner services utilisation was well into the upper quartile.

Queen Charlotte, though, was below the interquartile range. However, given that there were general practitioners working under alternative payment plans in this LHA, it

is unlikely that the actual overall provision of general practitioner services in this LHA was, in fact, below the provincial median. This statement assumes the non-MSP physicians provided a level of services to the LHA residents that approximated levels approaching those provided by the MSP physicians present.[8] The data appear to show that the general practitioner utilisation rates for all Northwest LHAs are reasonable compared to the provincial rates.

Medical Specialist Services. Two of the LHAs that had no physician FTEs billing through the MSP proved to be the highest utilisers of medical specialist services in the Region. The Nishga LHA was the highest user of these services with a rate well beyond the third quartile. It used almost twice as many services per 1000 than the residents of Prince Rupert or Smithers. Telegraph Creek was the second highest utiliser of medical specialist services per 1000 with a rate of utilisation above the provincial median. Since no medical specialists resided in these two LHAs, their populations had to travel in order to obtain these medical services. The extent to which these services were available 'closer to home' is examined later in this chapter.

A high utilisation of medical specialist services may be indicative of a 'sicker' population that requires services that cannot be provided by a general practitioner. Since the data do not indicate the severity of illness, judgements as to whether a population is 'sicker' are speculative. Nevertheless, as will be discussed in Chapter 6, indices of the health status of an LHA may be a guide as to the severity level of presenting health complaints.

[8] As mentioned, the Queen Charlotte LHA was one of the Northwest LHAs that had services provided by non-MSP physicians. Given that there were almost three times the number of non-MSP physicians compared to MSP-funded physicians, it can be expected that utilisation figures would be comparable.

The high utilisation could also be due to delay in seeking care from a general practitioner in areas where there is no general practitioner readily accessible. This is one possible explanation for the high utilisation of medical specialist services in Telegraph Creek, notwithstanding the fact that its population received a reasonable amount of general practitioner services. In the case of the Nishga, however, the presence of non-MSP physicians in the LHA makes this explanation less plausible.

The rates of use of specialist services for the other LHAs in the Region is around the level of the first quartile. These levels are, at best, marginally reasonable and it is not possible to discern whether these relatively low rates are due to referral practices of the general practitioners, travel barriers (in terms of time and cost), or whether general practitioners in these remote and rural areas are prepared to deal with medical and surgical problems that may be referred to specialists in more urbanised areas.

Geographical Access to Physician Services

The portrayal of access to physician services by using the volume of services rendered as an indicator is incomplete without examining the geographical accessibility. In the present study, geographical accessibility has been measured by where the services are rendered in relation to the 'home' LHA of the patient.

For the purposes of this analysis, it is assumed that physician services are provided within the residents' local health area are the most accessible.[9] Accessibility is progressively reduced as residents travel to other LHAs within the Region, to LHAs outside of the

[9] This definition does not take into account the fact that the medical services in one LHA may, in fact, be closer to a residence in an adjacent LHA. Further, it does not take into account factors such as travel time, costs of travel and various opportunity costs that may occur in seeking medical services. Nonetheless, it does provide one index of the availability of services.

Region, to major centres such as Vancouver, or 'elsewhere.'

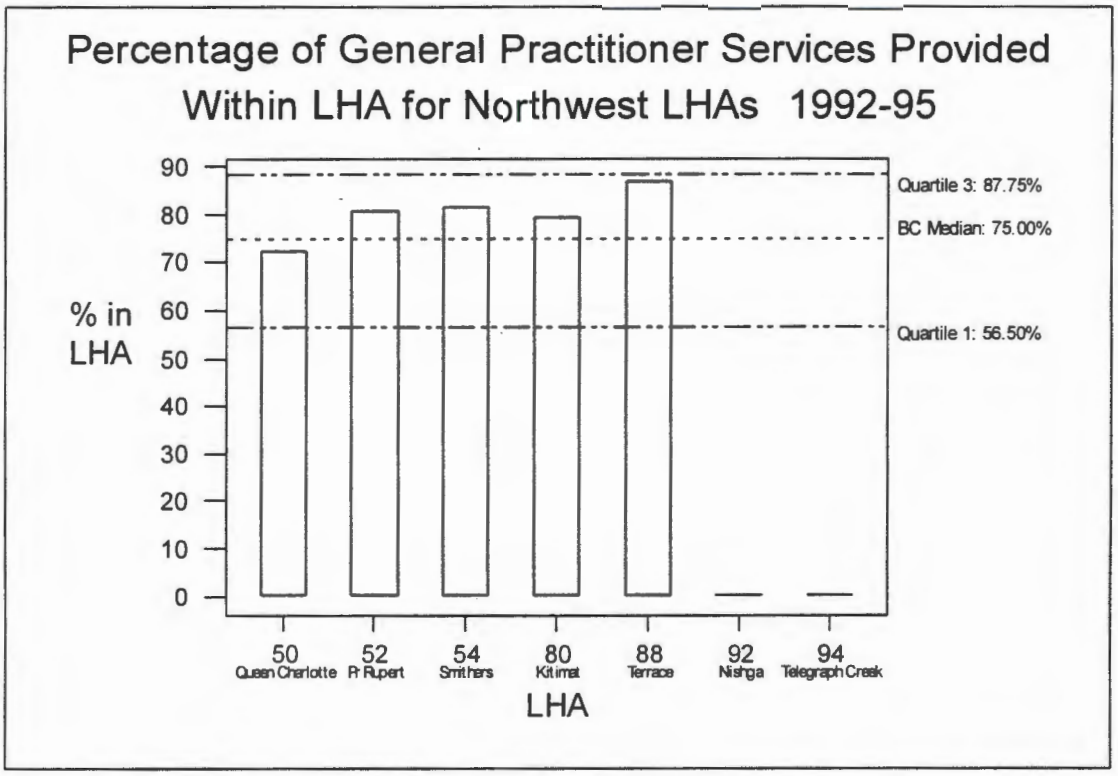
The following section examines the percentage of services received by residents of the seven LHAs in the various geographical areas, i.e., in their LHA, in their Region, in Vancouver, or elsewhere. General practitioners and specialists are examined separately to highlight the different patterns of accessibility for each type of practitioner.

General Practitioner Accessibility. Figures 5.3 through 5.6 show the utilisation of general practitioner services by geographical area. The general practitioner FTEs for the Northwest Health Region were previously displayed in Figure 4.1 and this information is important to consider when analysing accessibility to general practitioner services.

Figure 5.3 indicates that the percentage of general practitioner services provided in the resident LHA was within the interquartile range for Queen Charlotte, Prince Rupert, Smithers, Kitimat and Terrace. According to this data, the residents of Nishga and Telegraph Creek had no general practitioner services provided within their local health area, a finding that is consistent with the fact that these LHAs had no MSP physician FTEs during the study period.[10] Queen Charlotte showed a high percentage of general practitioner services provided within the resident LHA, even with a low number of physician FTEs.

[10] This finding is based exclusively on data provided by MSP and therefore does not include the contributions of alternative physician arrangements unless otherwise noted.

Figure 5.3: General Practitioner Services Provided within LHA, 1992-95



The accessibility of general practitioner services within the Northwest Health Region, is presented in Figure 5.4. This figure illustrates that a very high percentage of general practitioner services were provided within the Region for all of the LHAs. Six of the seven LHAs had service provision levels within the interquartile range, while the Terrace LHA was slightly above this range, suggesting easier access to general practitioner services for the residents of that LHA.

Figure 5.4: General Practitioner Services Provided within Region, 1992-95

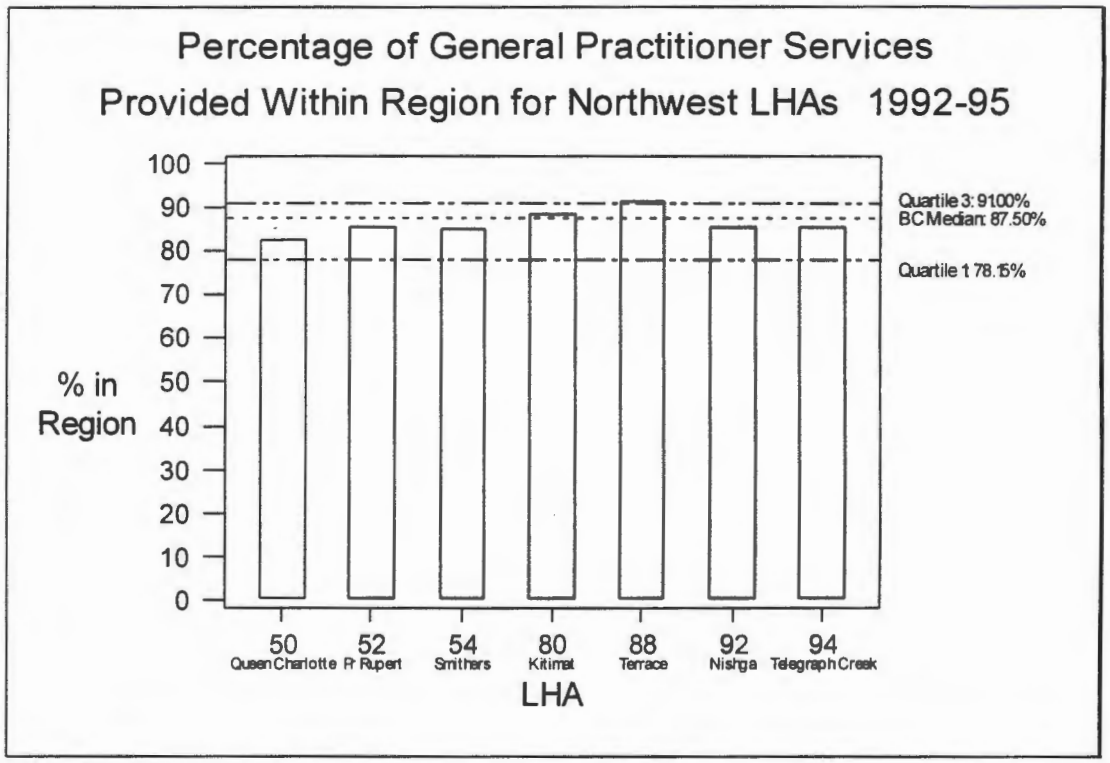
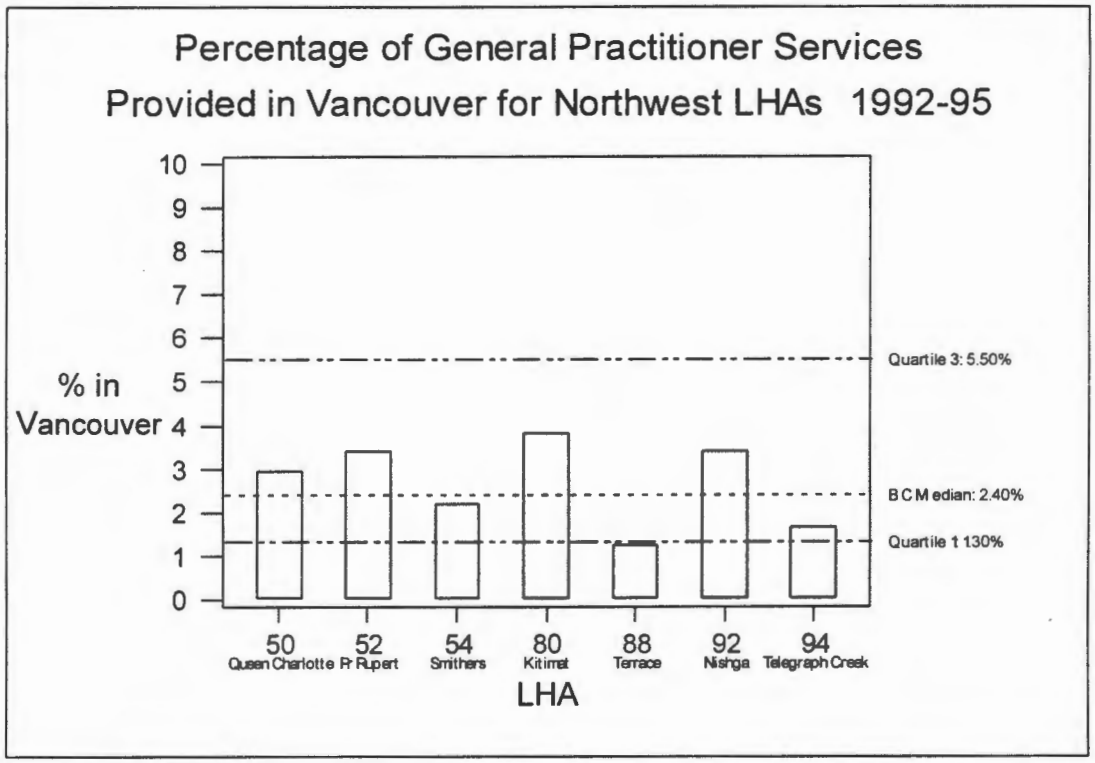


Figure 5.5 shows that few general practitioner services in Vancouver were sought by residents of the Northwest LHAs, with Terrace showing a very low utilisation of Vancouver general practitioner services, a finding consistent with the high intra-LHA utilisation. All other Northwest LHAs had utilisation rates for general practitioners within the interquartile range.

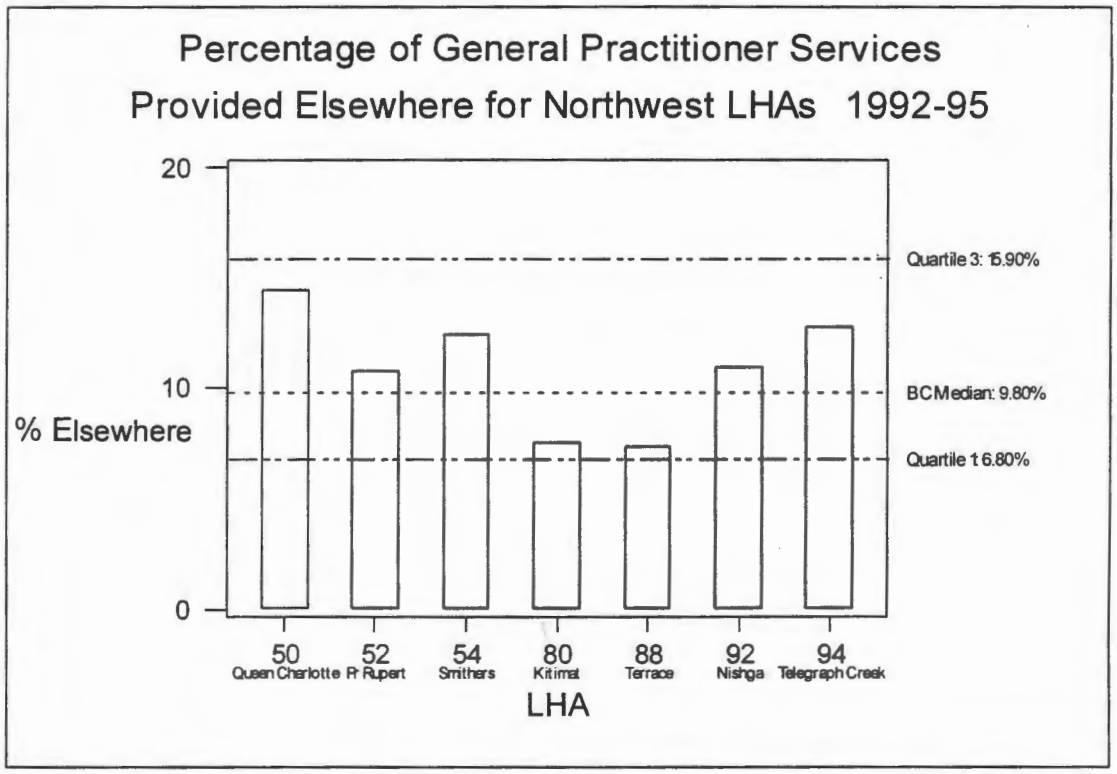
Figure 5.5: General Practitioner Services Provided in Vancouver, 1992-95



An important index of access is the percentage of general practitioner services obtained in other Health Regions, especially in neighbouring Regions that are geographically closer to the Northwest Health Region than Vancouver. Figure 5.6 shows the percentage of general practitioner services utilised by the residents of the Northwest LHAs that were provided in regions other than the Northwest and Vancouver Health Regions.

Figure 5.6 shows that all of the Northwest LHAs were within the interquartile range for general practitioner services rendered in other LHAs. It does not appear that residents of the Region needed to cross LHA boundaries to obtain their care more often than other LHAs in the Province.

Figure 5.6: General Practitioner Services Provided Elsewhere, 1992-95



Medical Specialist Accessibility. Figures 5.7 through 5.10 show the medical specialist services provided to residents of the LHAs of the Northwest Health Region according to where the services were provided, whether within LHA, within the Region, in Vancouver, or elsewhere. In interpreting these tables, it is important to keep in mind that there are few, if any, medical specialist FTEs in the individual local health areas.

Medical specialist services provided within the LHA are displayed in Figure 5.7. The four LHAs that had resident medical specialist FTEs had values better than the first quartile and three of these exceeded the provincial median. Notably, Terrace exceeded the third quartile with over half of the medical specialist services provided to residents within their LHA. Queen Charlotte had a very small percentage of services provided (0.033%) even though there were no medical specialist FTEs resident in this LHA during the study

period. This is likely the result of a visiting specialist billing for one-time services in the Queen Charlotte LHA.

The Nishga and Telegraph Creek LHAs had no medical specialist FTEs and no services rendered within their respective LHAs. This is not unusual in British Columbia since the first quartile value for medical specialist services for the Province is 0.00%, indicating that at least 25% of the LHAs in British Columbia local health areas cannot access medical specialist services within their home LHA.

Figure 5.7: Medical Specialist Services Provided within LHA, 1992-95

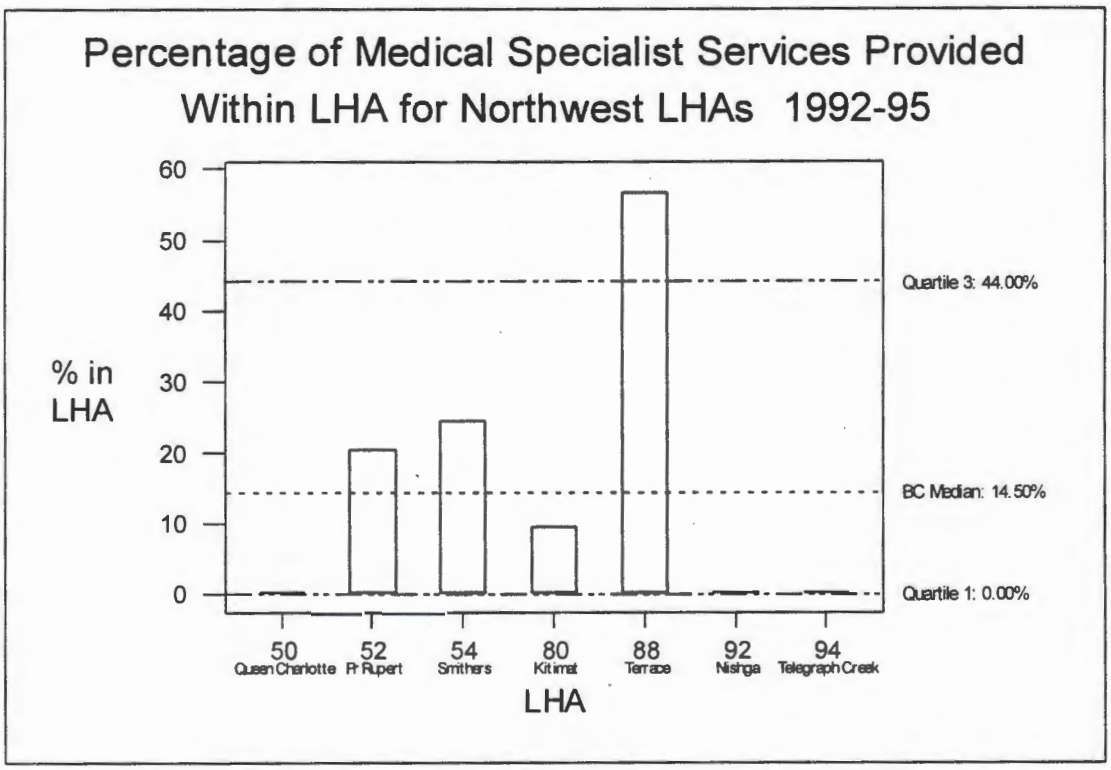
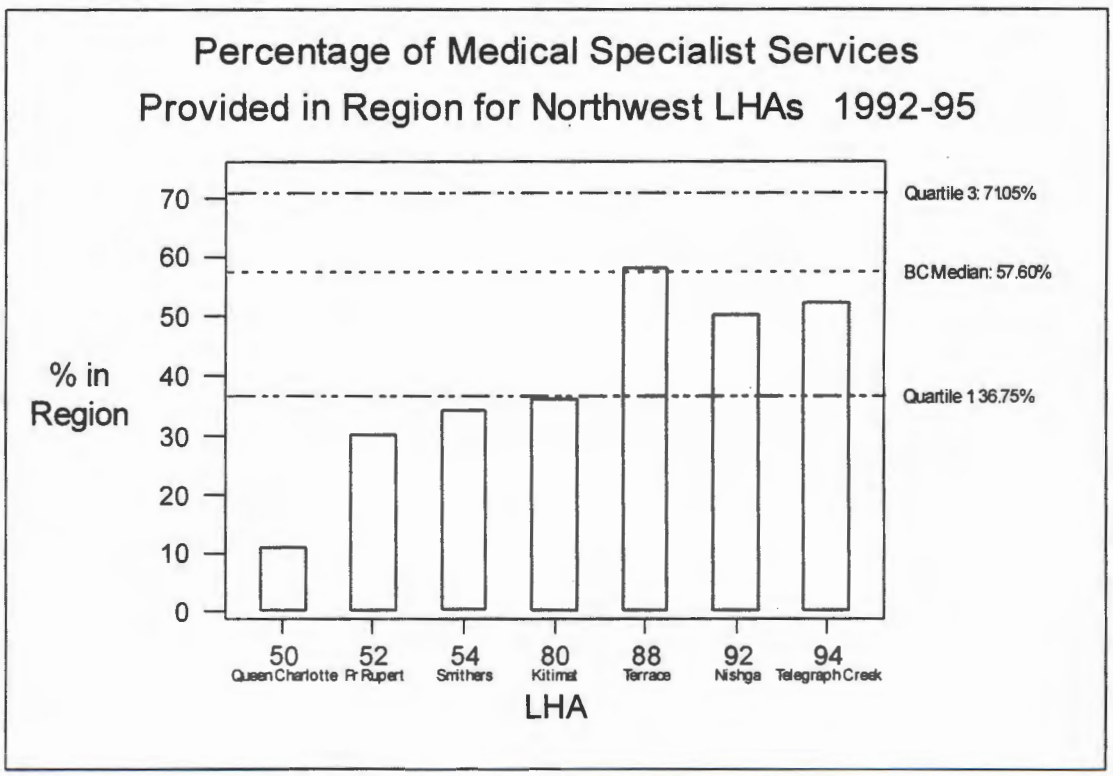


Figure 5.8 illustrates the provision medical specialist services within the Region. Terrace, Nishga, and Telegraph Creek were all within the interquartile range for this variable. Over half of the medical specialist services required by residents of these three LHAs were provided by physicians within the Region. Prince Rupert, Smithers and

Kitimat were below this level in terms of services provided within the Region, although it has already been observed that the medical specialist services provided within these LHAs were in the interquartile range,. The Queen Charlotte LHA was also significantly below this range of medical specialist services provided within the Region.

Figure 5.8: Medical Specialist Services Provided within Region, 1992-95



An examination of the medical specialist services provided in Vancouver for residents of the Northwest is depicted in Figure 5.9. Only Terrace and Telegraph Creek were within the interquartile range, though both were higher than the provincial median and near the third quartile. The other five LHAs, Queen Charlotte, Prince Rupert, Smithers, Kitimat, and Nishga, all had higher percentages than the interquartile range for

this indicator, suggesting that the residents of these LHAs are referred to Vancouver for their specialist services.

Figure 5.9: Medical Specialist Services Provided in Vancouver, 1992-95

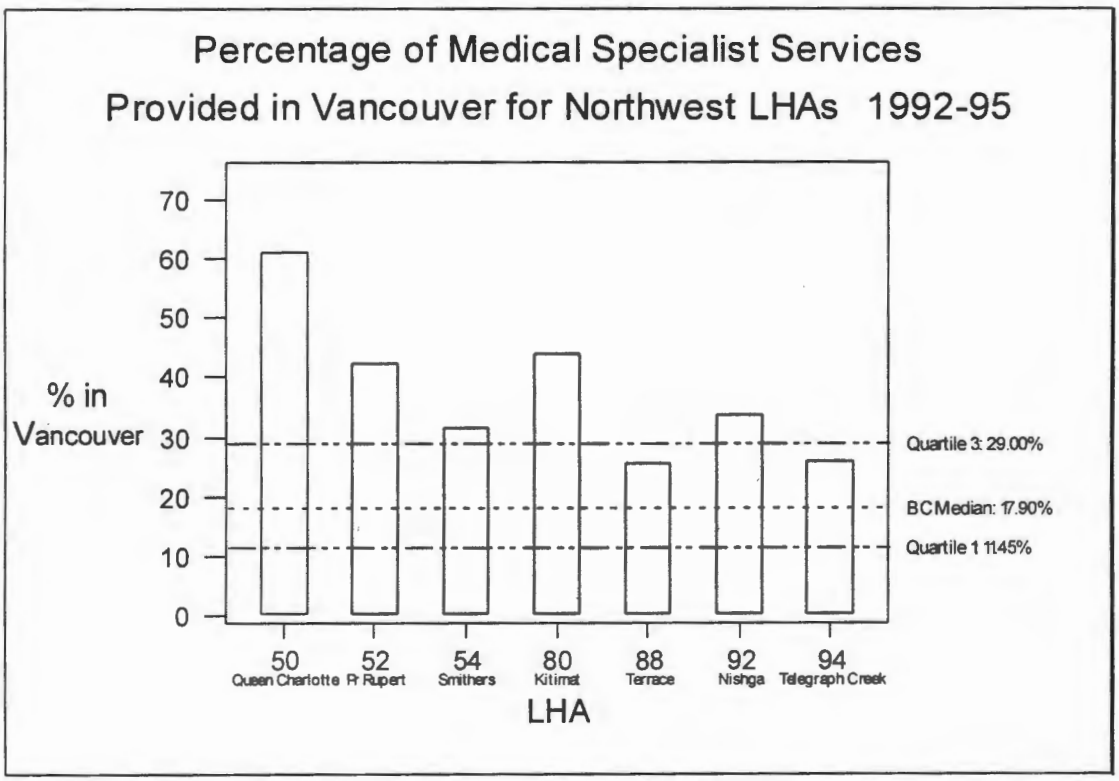
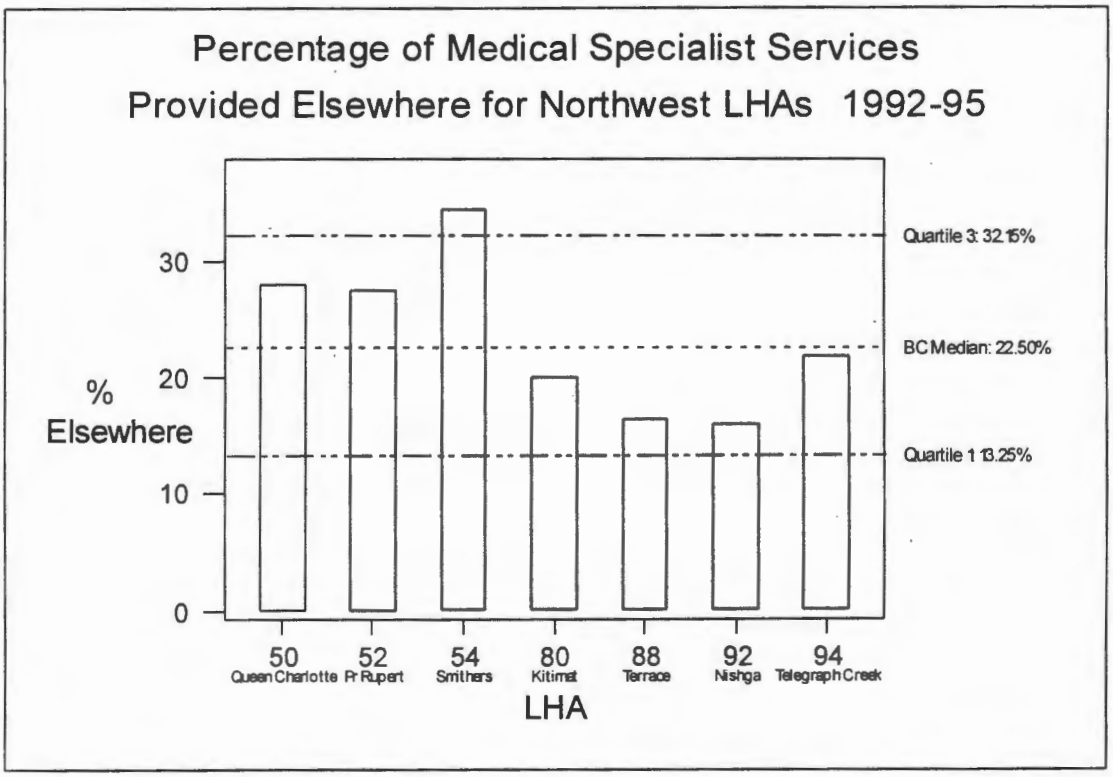


Figure 5.10 depicts medical specialist services utilised in another Region. All LHAs, except for Smithers, are within the interquartile range for services received in another Health Region.

Figure 5.10: Medical Specialist Services Provided Elsewhere, 1992-95



Discussion of Accessibility

General Practitioner Accessibility. With the exception of the Nishga and Telegraph Creek LHAs, all measures of accessibility to general practitioner services in the Northwest Health Region must be considered reasonable, using the provincial interquartile range as the criterion.

The low percentage of residents who received general practitioner services in Vancouver is probably accounted for by those residents who utilised services while travelling in or through Vancouver. This reinforces the interpretation that there is reasonable accessibility to primary medical services within the Region. This interpretation is supported by the fact that the percentage of residents that utilised services from general practitioners in other regions is also low.

Although residents of Telegraph Creek are unable to utilise primary physician services within their home LHA, they did receive a reasonable amount of primary services and 85% of these services were obtained within the Region. Telegraph Creek residents must necessarily travel to other LHAs within the Region, especially since it is understood that there are no physicians practising in this LHA under alternative payment arrangements. Under these circumstances, this LHA can be characterised as having a lower accessibility to primary physician care than the other LHAs in the Region.

In the case of the Nishga LHA, it is understood that two physicians were practising under alternative arrangements in the LHA. The quantity of services that they delivered is not known as these were not reported to MSP for inclusion in its datasets.

The high percentages of general practitioner services rendered within the local health areas and within the Region, coupled with the low combined percentage of services provided outside the Region (Vancouver and elsewhere), suggests that there is a reasonable degree of access to general practitioners for most of the local health areas in the Northwest Health Region.

Discussion of Medical Specialist Accessibility. Only the population of the Terrace LHA had a reasonable provision of medical specialist services within LHA and Region, with low percentages of services received within Vancouver and elsewhere, reflecting the concentration of specialists in that centre.

Although Prince Rupert, Kitimat and Smithers utilised a reasonable amount of specialist services *within their LHA*, their utilisation *within Region* was lower than the reasonable rate. This is unusual, since the rate of utilisation within Region is usually an improvement over the rate within LHA. The 'within Region' rates for these LHAs may

have been influenced by increased utilisation of services outside of the region. Both Prince Rupert and Kitimat received most of their medical specialist services in Vancouver while the Smithers LHA's highest rate of utilisation occurred in other regions.

The proximity of the Smithers LHA to the Northern Interior Health Region, with a range of medical specialist services in the urban centre of Prince George, may explain the high utilisation of services provided 'elsewhere.' Although Prince George lacks many of the medical specialties found in Vancouver, there are enough specialist FTEs in Prince George to warrant travel from the Smithers LHA to this centre.

The first quartile for the percentage of services provided 'within LHA' for the Province has a value of zero, indicating that 25% of the LHAs in the Province had no medical specialist services provided in the LHA. The definition of reasonable becomes difficult to interpret in this case, but not all LHAs in British Columbia require, or could support, the provision of specialist services. Areas with low populations or that do not have facilities would have difficulty in justifying (let alone attracting) medical specialists. The three LHAs that not have access to specialist services within their LHA qualify on both these grounds.

It is difficult to determine why the utilisation within Region is so low for Prince Rupert and Kitimat. Both LHAs are geographically adjacent to the Terrace LHA so travel concerns do not seem to be the chief reason for higher utilisation in Vancouver. In contrast, Nishga and Telegraph Creek, with no specialists at all, were well provided for within Region, even though travel considerations would seem to be more significant.

The values for Queen Charlotte are particularly notable, with over 60% of the medical specialist services provided in Vancouver. This is most likely due to the fact that

the Queen Charlotte Islands are as geographically isolated from the other local health areas of the Northwest Health Region as they are from Vancouver. Hence, the cost of travel to Vancouver would be comparable to travel to a centre within the Region that could provide the necessary medical specialist services (such as Prince Rupert and Terrace). Given this choice, the patient and/or the referring physician may elect to have the services provided in the tertiary care centres in Vancouver.

In general, most of the LHAs in the Northwest depend on Vancouver for a large proportion of their specialist services. Although there are over 14 medical specialist FTEs in the Northwest Health Region, the number of specialists, the mix of specialties, and the need for supporting services for much specialty care means that residents must travel outside the Region.

Clearly, the dispersed nature of the population in the Northwest Health Region contributes to the inability of some residents to access specialist services 'closer to home.' The lack of specialist services in many local health areas can be seen as an inherent trait of those LHAs with widely distributed populations, since the inability of smaller LHAs to support specialist services is consistent throughout the Province.

CHAPTER 6

RESULTS AND DISCUSSION:

THE HEALTH STATUS INDEX FOR THE LOCAL HEALTH AREAS OF BRITISH COLUMBIA AND THE NORTHWEST HEALTH REGION

Problem statement 3 guides the analysis in this chapter. It investigates:

> What is the level of population health status in the LHAs of the Northwest Health Region, and how does this compare to the level in other LHAs, and in the Province as a whole?

The importance of measuring health status has been stated in both the literature review and methods sections of this thesis. The present study has adopted the measure used by Foster et al. (1994) but with more recent datasets and with a revised selection of indicators. The result of this work is presented as a health status index for the LHAs of British Columbia.

As mentioned in the methods chapter, the resulting index is composed of various SMR and BRR values that were combined to create an overall 'Total Health Status Index' (THSI) value. As well, groupings of select SMRs and BRRs also create the sub-indices of the Disease Index, the Lifestyle Index and the Birth Index.

The British Columbia Health Status Index

Table 6.1 presents the various Health Status Index values for each LHA in the Province. Individual values for the local health areas of the Northwest Health Region were also determined and are highlighted in the resulting tables and discussion. All LHAs are ranked based on their Total Health Status Index value. For ease of analysis and to more readily compare LHAs to one another, quartile values have been assigned to each index, based on the provincial median and first and third quartiles.

Table 6.1: Health Status Indices and Quartile Values for all British Columbia Local Health Areas* 1991-95

LOCAL HEALTH AREA	Disease Index	Quartile	Lifestyle Index	Quartile	Birth Index	Quartile	TOTAL INDEX	Total Quartile
64 - Gulf Islands	0.80	1	0.59	1	0.67	1	0.71	1
04 - Windermere	0.68	1	0.62	1	0.92	1	0.74	1
38 - Richmond	0.84	1	0.59	1	0.76	1	0.75	1
45 - West Vancouver	0.91	1	0.62	1	0.74	1	0.79	1
63 - Saanich	0.83	1	0.55	1	0.97	2	0.79	1
37 - Delta	0.96	2	0.53	1	0.82	1	0.81	1
34 - Abbotsford	0.86	1	0.67	1	0.86	1	0.81	1
03 - Kimberley	0.87	1	0.80	1	0.81	1	0.84	1
44 - North Vancouver	1.02	2	0.76	1	0.70	1	0.86	1
35 - Langley	0.97	2	0.74	1	0.82	1	0.87	1
46 - Sunshine Coast	0.86	1	0.84	2	0.93	2	0.87	1
01 - Fernie	1.01	2	0.47	1	1.01	2	0.87	1
71 - Courtenay	0.93	2	0.78	1	0.90	1	0.88	1
23 - Central Okanagan	0.86	1	0.83	2	0.98	2	0.88	1
21 - Armstrong-Spallumcheen	0.89	1	0.76	1	0.99	2	0.88	1
62 - Sooke	1.00	2	0.76	1	0.85	1	0.90	1
77 - Summerland	0.97	2	0.86	2	0.86	1	0.91	1
42 - Maple Ridge	1.09	3	0.65	1	0.90	1	0.92	1
36 - Surrey	0.95	2	0.86	2	0.94	2	0.92	1
43 - Coquitlam	1.15	4	0.70	1	0.78	1	0.93	1
18 - Golden	0.98	2	0.99	2	0.78	1	0.93	2
69 - Qualicum	1.00	2	0.74	1	0.98	2	0.93	2
54 - Smithers	**0.92**	**1**	**0.93**	**2**	**1.04**	**2**	**0.95**	**2**
15 - Penticton	0.82	1	0.96	2	1.16	3	0.95	2
22 - Vernon	1.09	3	0.75	1	0.96	2	0.96	2
41 - Burnaby	1.07	3	0.87	2	0.88	1	0.97	2
05 - Creston	0.91	1	1.17	3	0.92	1	0.97	2
20 - Salmon Arm	0.91	1	0.88	2	1.16	3	0.97	2
47 - Powell River	0.95	2	1.10	3	0.90	1	0.98	2
61 - Greater Victoria	1.00	2	1.01	2	0.94	2	0.99	2
60 - Peace River North	1.10	3	0.83	2	0.98	2	0.99	2
16 - Keremeous	0.84	1	1.31	4	1.01	2	0.99	2
11 - Trail	1.14	4	0.81	2	0.97	2	1.00	2
48 - Howe Sound	1.09	3	1.01	2	0.91	1	1.02	2
80 - Kitimat	**1.07**	**3**	**1.01**	**2**	**0.92**	**1**	**1.02**	**2**
33 - Chilliwack	1.05	3	0.87	2	1.12	3	1.02	2
12 - Grand Forks	1.04	2	0.76	1	1.24	3	1.02	2
68 - Nanaimo	1.02	2	0.99	2	1.14	3	1.04	2
75 - Mission	1.10	3	0.86	2	1.15	3	1.05	2
14 - South Okanagan	1.03	2	0.92	2	1.20	3	1.05	2

Table 6.1: continued

LOCAL HEALTH AREA	Disease Index	Quartile	Lifestyle Index	Quartile	Birth Index	Quartile	TOTAL INDEX	Total Quartile
65 - Cowichan	1.14	3	0.68	1	1.27	3	1.05	3
07 - Nelson	0.99	2	1.08	3	1.14	3	1.06	3
26 - North Thompson	0.82	1	1.18	3	1.49	4	1.06	3
02 - Cranbrook	1.16	4	0.96	2	1.05	2	1.08	3
72 - Campbell River	1.03	2	1.05	3	1.28	3	1.10	3
78 - Enderby	1.01	2	1.38	4	1.02	2	1.11	3
06 - Kootenay Lake	0.84	1	1.90	4	1.22	3	1.11	3
09 - Castlegar	1.09	3	1.01	3	1.23	3	1.11	3
67 - Ladysmith	1.05	3	1.20	3	1.21	3	1.13	3
59 - Peace River South	1.10	3	1.27	3	1.09	2	1.14	3
28 - Quesnel	1.09	3	1.14	3	1.23	3	1.14	3
13 - Kettle Valley	0.94	2	1.42	4	1.41	4	1.14	3
76 - Agassiz-Harrison	0.79	1	1.41	4	1.51	4	1.15	3
39 - Vancouver	1.00	2	1.59	4	1.02	2	1.16	3
27 - Cariboo-Chilcotin	1.10	3	1.16	3	1.25	3	1.16	3
70 - Alberni	1.05	3	1.07	3	1.42	4	1.16	3
66 - Lake Cowichan	1.12	3	1.16	3	1.34	3	1.19	3
24 - Kamloops	1.22	4	1.26	3	1.11	2	1.20	3
56 - Nechako	1.10	3	1.16	3	1.46	4	1.21	3
55 - Burns Lake	1.15	4	1.22	3	1.44	4	1.24	3
10 - Arrow Lakes	1.06	3	1.28	3	1.50	4	1.24	4
19 - Revelstoke	1.35	4	1.20	3	1.10	2	1.25	4
57 - Prince George	1.25	4	1.25	3	1.32	3	1.27	4
40 - New Westminster	1.11	3	1.81	4	1.12	2	1.30	4
88 - Terrace	**1.15**	**4**	**1.44**	**4**	**1.47**	**4**	**1.31**	**4**
85 - Vancouver Island North	1.20	4	1.01	2	1.83	4	1.32	4
84 - Vancouver Island West	1.28	4	1.07	3	1.59	4	1.33	4
50 - Queen Charlotte	**1.13**	**3**	**1.98**	**4**	**1.17**	**3**	**1.35**	**4**
87 - Stikine	**0.72**	**1**	**1.85**	**4**	**2.01**	**4**	**1.42**	**4**
31 - Merritt	1.29	4	1.88	4	1.39	4	1.44	4
30 - South Cariboo	1.24	4	1.61	4	1.74	4	1.47	4
81 - Fort Nelson	1.64	4	1.20	3	1.40	4	1.48	4
32 - Hope	1.43	4	1.88	4	1.40	4	1.54	4
17 - Princeton	1.33	4	1.95	4	1.65	4	1.55	4
29 - Lillooet	1.38	4	2.12	4	1.31	3	1.56	4
52 - Prince Rupert	**1.32**	**4**	**2.54**	**4**	**1.34**	**3**	**1.65**	**4**
92 - Nishga	**1.25**	**4**	**2.18**	**4**	**1.78**	**4**	**1.70**	**4**
49 - Central Coast	1.57	4	2.50	4	1.73	4	1.86	4
94 - Telegraph Creek	**0.92**	**1**	**3.93**	**4**	**2.02**	**4**	**1.95**	**4**
Provincial Median	1.04		1.01		1.12		1.05	

* Northwest Health Region LHA values in ***bold*** type.
note: Quartiles are based on four groups of equal size based on the provincial median Total Health Status Index value and the first and third quartiles.

As indicated in Table 6.1, the Total Health Status Index values for the 79 British Columbia LHAs ranged from 0.71 to 1.95 (best to worst) with a provincial median value of 1.05. Only two Northwest LHAs, Smithers (0.95) and Kitimat (1.02), had values within the interquartile range. Both of these LHAs were in the second quartile while the other six Northwest LHAs were all in the fourth quartile of the Total Health Status Index. In descending order the other LHAs had THSI values of 1.31 (Terrace), 1.35 (Queen Charlotte), 1.42 (Stikine), 1.65 (Prince Rupert), 1.70 (Nishga), and 1.95 (Telegraph Creek). It can be seen that Telegraph Creek had the highest THSI value in the Province. In fact, three of the four worst LHAs in BC were Northwest LHAs, with Prince Rupert, Nishga, and Telegraph Creek ranking 76th, 77th and 79th, respectively.

The Health Status of the Northwest Local Health Areas

In order to examine the Northwest LHAs independently of all other LHAs in the Province, the index values for these LHAs are shown in Table 6.2. The overall ranking of the LHAs in relation to the other LHAs in the Province is also shown.

Table 6.2: Northwest LHAs Health Status Quartiles and Overall Provincial Ranking

LOCAL HEALTH AREA	Disease Index	Quartile	Lifestyle Index	Quartile	Birth Index	Quartile	TOTAL INDEX	Total Quartile	Ranking within 79 LHAs
54 Smithers	0.92	1	0.93	2	1.04	2	0.95	2	23rd
80 Kitimat	1.07	3	1.01	2	0.92	1	1.02	2	35th
88 Terrace	1.15	4	1.44	4	1.47	4	1.31	4	65th
50 Queen Charlotte	1.13	3	1.98	4	1.17	3	1.35	4	68th
87 Stikine	0.72	1	1.85	4	2.01	4	1.42	4	69th
52 Prince Rupert	1.32	4	2.54	4	1.34	3	1.65	4	76th
92 Nishga	1.25	4	2.18	4	1.78	4	1.70	4	77th
94 Telegraph Creek	0.92	1	3.93	4	2.02	4	1.95	4	79th
Provincial Median	1.04		1.01		1.12		1.05		

Smithers had the best overall ranking of all the Northwest LHAs (23rd in the Province), while Telegraph Creek had the worst overall ranking for both the Northwest and for the Province as a whole (79th). Only Smithers and Kitimat reached Total Health Status Index values within the interquartile range. The other six Northwest LHAs were in the fourth quartile and placed in the 15 worst LHAs of the Province.

Discussion of Health Status in the Northwest Health Region

The definition of a reasonable level of health status is defined by the same criterion, the interquartile range, as was used to assess the appropriate provision of medical services. Therefore, by definition, an index value that falls in the second and third quartiles indicates that the LHA is deemed to have a 'reasonable' health status. Since lower Health Status Index values indicate a superior level of health status, any values in the first quartile are considered 'better' than the reasonable range, while those values in the fourth quartile are considered 'worse' than this range.

Smithers and Kitimat had lower Total Health Status Index scores by virtue of their strong scores in each sub-index. All three sub-index scores for Smithers were below the provincial median, particularly the Disease Index value, which contributed to an overall health status score very near the first quartile. The Kitimat LHA had two of its three sub-index scores below the provincial median, with the low Birth Index score contributing to its ranking as 35th in the Province and its placement in the second quartile. The populations of both of these LHAs had a reasonable degree of health status, by definition.

In contrast, the six other LHAs in the Region were well outside of the interquartile range. The common factor in the pattern of sub-indices was a high Lifestyle Index value. As noted in Table 6.2, these scores ranged from 1.44 for Terrace to 3.93 for Telegraph

Creek. These scores are all higher than the median score of 1.01 and were a major contribution to the high Total Health Status Index value for each of these LHAs.

The importance of displaying sub-index scores becomes apparent when examining those LHAs with wide-ranging sub-index values. Both Stikine and Telegraph Creek had low, first quintile scores in the Disease Index category but their high scores in the Lifestyle and Birth indices offset the contribution of the favourable Disease Index to their Total Health Status Index value. It appears that the strategy of using a combination of indicators allows for a critical assessment of an overall population health status that is determined from a broad selection of mortality and birth related events.

It would be inappropriate to attempt to characterise the overall health status of the Northwest Health Region. There are distinct differences between the two well-ranked LHAs (Smithers and Kitimat) and the remaining six which have such a poor degree of health status. The reasons for these conspicuous differences among these specific LHAs are difficult to determine given the myriad of factors that contribute to health status. Within the broad framework of the social determinants of health, it would be necessary to include a wide range of social, cultural and economic factors to account for these differences.

Nevertheless, notwithstanding (or because of) the conflicting evidence in the literature with respect to the contribution of medical services to population health status, this thesis provides an opportunity to examine whether there is an association between health status and the medical service utilisation patterns that have been described in the previous chapters. This association is presented and discussed in the following chapter.

CHAPTER 7

RESULTS AND DISCUSSION:

THE ASSOCIATION BETWEEN HEALTH STATUS AND PHYSICIAN SERVICES IN THE NORTHWEST HEALTH REGION

This chapter examines problem statement 4, which inquired:

What is the relationship, if any, between the population health status and the utilisation of physician services in the Northwest Health Region?

The intent of this chapter is to determine whether there is any relationship between the level of health status among the populations of the Northwest LHAs and their utilisation of medical services. Values from the Medical Resource Utilisation dataset were correlated with the Total Health Status Index values of the Northwest Health Region LHAs. The results of these analyses are presented in Table 7.1

Table 7.1: Correlation and Simple Regression Outcomes of Medical Service Variables with Health Status Index in the Northwest Health Region* 1992-95

Medical Service Measure	Pearson Correlation with Health Status Index	r - squared	p - value
Total Physician FTE	-0.484	0.234	0.026 +
Population/Total Physician FTE ratio	0.423	0.179	0.103
Total Physician Services per 1000	0.110	0.012	0.634
General Practitioner FTE	-0.525	0.275	0.015 +
Population/General Practitioner FTE ratio	0.425	0.180	0.101
General Practitioner Services per 1000	-0.158	0.025	0.493
General Practitioner % In LHA	-0.754	0.569	0.000 +
General Practitioner % In Region	-0.170	0.029	0.461
General Practitioner % In Vancouver	-0.094	0.009	0.686
General Practitioner % Elsewhere	0.214	0.046	0.352
Medical Specialist FTE	-0.260	0.067	0.256
Population/Medical Specialist FTE ratio	-0.281	0.079	0.376
Medical Specialist Services per 1000	0.476	0.226	0.029 +
Medical Specialist % In LHA	-0.363	0.132	0.105
Medical Specialist % In Region	-0.294	0.086	0.196
Medical Specialist % In Vancouver	-0.216	0.047	0.346
Medical Specialist % Elsewhere	-0.262	0.069	0.250

* excluding LHA 87 Stikine (see chapter 3 for limitations of Stikine data)

+ significant at $p \leq 0.05$

The Association between Health Status and Physician Services

Table 7.1 indicates that four medical service variables had a statistically significant (at $p \leq 0.05$ level) correlation with the Total Health Status Index values for the Northwest Health Region. All other correlation coefficients were not statistically significant.

The first significant finding indicated that the sum of physician FTEs (i.e., for both general practitioners and medical specialists) had a statistically significant negative correlation with health status in the Northwest LHAs ($r = -0.484$; $p = 0.026$). Given that the lower the value of the Total Health Status Index, the worse the health status, this finding can be interpreted to mean that areas with a low number of physician FTEs have low levels of health status.

The second statistically significant negative correlation occurred between the general practitioner FTE values and health status ($r = -0.525$, $p = 0.015$). That is, the worse the health status, the fewer general practitioner FTEs practicing in the LHA.

The percentage of general practitioner services provided within LHA had a significant negative correlation with the health status values in the Northwest ($r = -0.754$, $p < 0.000$). That is, the worse the health status, the fewer the general practitioner services provided within the LHA.

While the first three significant correlations were negative, the fourth correlation was positive. Medical specialist services per 1000 was found to be significantly correlated with health status values ($r = 0.476$; $p = 0.029$). This means that the worse the health of the population, the more medical specialist services that were used.

Discussion of Correlations

The correlations in this chapter are not intended to evaluate whether or not the utilisation of physician services affects health status. Any statistically significant relationships that are found provide only a challenge of interpretation.

The first significant negative correlation, between health status and total physician FTEs, suggests that areas with the lowest number of total physician FTEs had the lowest level of health status. While the low level of health status may suggest that these LHAs may in fact need more physicians, no correlation was found between health status and total physician services per 1000 received, suggesting that these LHAs had adequate utilisation of physician services, regardless of health status.

A similar relationship was also observed between health status and general practitioner FTEs. At face value, this significant correlation might indicate that the LHAs with the highest need for general practitioners had the lowest general practitioner FTEs. Again, this hypothesis is not borne out in the correlation of general practitioner services per 1000 with the health status value.

It seems that these two significant correlations reflect factors that may influence both the supply of physicians to a geographical area and the health status of a population. This kind of relationship may also exist in urban areas that are characterised by a low health status, areas in which physicians do not traditionally locate.

The significant correlation between health status and percentage of general practitioner services provided within the LHA suggests that the areas with the highest need (i.e., the worst health status values) received the fewest primary physician services within their home LHA. This may not be a cause for concern, since it was shown in

chapter 5 that access to general practitioner services was reasonable for five of the seven Northwest LHAs. However, the two LHAs that did not have any medical services provided by MSP general practitioners in their LHA (Nishga and Telegraph Creek) also had the lowest levels of health status in the Region, as well as two of the lowest levels in the Province.

The final significant correlation was between health status and medical specialist services per 1000. The positive correlation indicates that as health status becomes poorer, the utilisation of medical specialist services increases. This might indicate that Northwest LHAs with poor health status were 'sicker,' requiring referral to a medical specialist, rather than having services provided by a general practitioner. This becomes particularly relevant in areas that have limited access to general practitioner services since referral patterns to medical specialists may be different in these areas. This might result from the variability in individual patterns of practice or the lack of technical support for the types of services that could be provided by a similar general practitioner in an urban setting.

It is very important to note that although the *total* physician services per 1000 had no association with health status, medical specialist services per 1000 showed a significant correlation with health status. This would seem to validate the decision to examine general practitioner and medical specialist services separately.

The lack of correlation between total physician services and health status seems to suggest that a reduced level of health status does not necessarily indicate the need for medical services. More importantly, it seems to confirm the notion that a myriad of variables, not just medical services, contributes to population health status. This can be difficult to understand since the Total Health Status Index is made up of mortality and

birth related ratios, all of which are derived from service provision to those who, by virtue of the nature of the ratios (dying or birthing), would undoubtedly require medical services to attend to the presenting ailment or birth event. It is suppositions such as this that verify the difficulty of quantifying health and health status in relation to the provision of medical services.

CHAPTER 8

SUMMARY AND CONCLUSIONS

In this chapter, the major findings of the study that have been reported and discussed in Chapters 4 to 7 are summarised and, to the extent possible, synthesised. In addition, the limitations of the methodology are elaborated and directions for future research are suggested.

The major objective of this study was to describe the physician supply, the medical services utilisation, and the health status for the Northwest Health Region of British Columbia. The relationships between these three variables are examined but, because such relationships are complex, the study does not attempt to provide a definitive interpretation of those relationships that emerged in the analysis. This study, however, has attempted to establish an empirical foundation upon which frameworks for interpretation and explanation can be built and which can serve as a basis for future research and policy development.

Major Findings

The findings of this study should be placed within the context of previous research. The problems of physician supply and perceived shortages of physician services has been the basis of much research in Canada (Horne, 1986; Horne, 1988; Barer and Stoddart, 1991; Black et al., 1994; Tataryn et al., 1994; Fakhoury and Roos, 1996) perhaps because of the widely scattered population over the vast geographical distances of the country. Indeed, this past research has served as one impetus to undertake the investigation reported here. However, not all of these studies examined the utilisation and

accessibility of medical services within specific geographical areas nor in the context of the physician supply nor in relation to the health status of the area.

In the present study, since the Northwest Health Region has generally been characterised as having a 'shortage' of physicians and their services as well as having poor health status, a central issue addressed in this thesis is the nature of the relationship between these variables. In so doing, the research has relied on previous studies that have looked at the development of indices of population health status (Foster et al., 1994; Frohlich and Mustard, 1994; Tataryn et al., 1994). Specifically, the Total Health Status Index utilised in this study was adapted from Foster et al. (1994). The Index serves as a reliable measure of health status for local health areas (LHAs) in British Columbia, enabling comparisons to be between individual LHAs and with the provincial median.

Physician Supply. This study has shown that the physician supply across the Northwest Health Region is not uniform. Some LHAs have few or no physician full time equivalents (FTEs), but the majority of LHAs were judged to be reasonably supplied, using the interquartile range for the Province as the criterion. It also noted that, while supply was measured on the basis of physicians funded by the BC Medical Services Plan, LHAs with no MSP physicians may have had physicians working under alternative arrangements. While Queen Charlotte, Nishga and Telegraph Creek were found to have a lower level of general practitioners based on practitioner/population ratios, the number of physicians working under alternative plans would have a significant impact upon these ratios if their full time equivalents were factored in. For example, if sessional physicians were assumed to contribute 1 FTE each, both Queen Charlotte and Nishga LHAs would have had general practitioner physician/population ratios in the interquartile range.

The analysis of medical specialist FTEs and population ratios showed that Prince Rupert, Smithers and Terrace LHAs had a reasonable supply when compared to the rest of the Province. These three LHAs also have a 'regional' centre and catchment areas that are large enough to support the services provided by medical specialists. No medical specialists are found located in those LHAs which are characterised by small communities and widely dispersed populations.

While the research seems to show that the supply of general practitioners in the Northwest Health Region seems to be reasonable, the study does not address the problems of attracting physicians to work in the Region, ensuring that there is the 'right mix' of specialists and general practitioners, and ensuring the 'right mix' amongst the specialists themselves. Issues that arise from physician turnover and the need for physicians to be fully familiar with the culture and needs of the Region are also not touched upon. In other words, while the data reflect a reasonable supply of physicians to the Region, the difficulties that the Region faces in providing medical services in a 'closer to home' context are glossed over. It is not the intention of this study to suggest that the perception that the Region may have a 'shortage' of physicians is erroneous, and it needs to be emphasised that the dynamics of physician supply to the Region need to be examined further using a different approach to the 'head count' method employed here. The results here constitute a 'snapshot in time' but do not characterise how the physician supply evolved, how it can be maintained, and how it will develop in the future.

It is noteworthy, however, that the admittedly anecdotal evidence on the physicians who were known to be working in the Region on alternative payment plans

suggests that the 'fee-for-service' arrangement may not always be the strategy of choice in attracting physicians to the various northern and remote areas.

Nevertheless, the fact remains that the geographic, cultural, economic factors that characterise the Region will continue to pose problems in ensuring a reasonable supply and 'mix' of physicians. The supply will continue to be governed by these factors, regardless of the supply of physicians within the larger jurisdiction of the Province of British Columbia.

For example, while physicians can, theoretically, achieve target incomes based on fee-for-service billing even in small communities (particularly where incentive schemes may be in place), northern and remote areas will continue to have difficulty in competing with urban areas for practitioners because enhanced remuneration is one 'trade-off' against the perceived hardships of life in the North. A comparison may be made with those physicians who choose to practice in urban areas already saturated with physicians, where they choose to exchange limited income opportunities for perceived life style gains.

It has already been noted in the literature review that the social and cultural attributes of a region also affect physician supply. The quality of life for spouse and family has been shown to be an important determinant of physician mobility (Barer and Stoddart, 1991; Rourke, 1993). Areas with a perceived lack of social and cultural opportunities are disadvantaged in their ability to attract physicians.

There are also compelling professional considerations in attracting physicians to communities such as those in the Northwest Region. Physicians expect (and need) supporting facilities, such as access to hospitals and laboratory services, to support their practice. Further, smaller populations are often unable to support economically feasible

group practices that provide the collegial relationships and 'on call' rotations that are central to modern medical practice.

Medical specialist recruitment and retention are heavily influenced by the need for specialised facilities and many specialties require the complementary services of other specialists, as in the case of surgeons and anaesthesiologists.

In the face of these problems in recruiting physicians for areas such as the Northwest Health Region, the fact is that in the period studied, the region maintained a reasonable supply of both general practitioner and specialist physicians. The question that stems from these figures, and that can be addressed by existing data, is the extent to which these physicians provided services to the population and the extent to which the population sought services within and without the LHA and the Region. This question is addressed in the following sections.

Physician Services Utilisation. This study has shown that those Northwest LHAs that have few physician FTEs are among the high utilisers of medical services when compared to those LHAs within the Region that have a 'reasonable' number of physicians providing services and to other LHAs in the Province. Even those areas without physicians receive services at a rate comparable to, or higher than, the rest of the Province. This finding suggests that physician service utilisation is not as dependent on physician supply, even in northern and remote areas as is popularly believed to be the case. Nevertheless, higher utilisation may suggest an increased need for medical services based on health status. Determining the appropriate supply of physicians and utilisation levels will remain the subject of far more focused research than undertaken in this thesis.

Access to General Practitioner Services. Most LHAs in the Northwest had a reasonable degree of access to general practitioner services within their LHA and those that did not had a reasonable degree of accessibility within the Region. Few general practitioner services were utilised outside of the Northwest and, those that were, were usually provided in a region other than Vancouver, most likely the Northern Interior Health Region. The latter region is the closest region that can be accessed from the Northwest by road.

Access to Medical Specialist Services. The results of the study suggest that access to medical specialist services, unlike that of general practitioners, may be a focus of concern. Some of the LHAs in the Northwest utilised fewer specialist services than other LHAs in the Province, partly because there were few specialist FTEs located in these LHAs. Access to specialists is frequently necessary on an emergency basis (for example, in cases of trauma, motor vehicle accidents, adverse cardiac events etc.) and, even where urgency does not characterise the presenting medical problem, residents must necessarily incur significant costs in travelling to a region (usually Vancouver) where the specialists are located. These imperatives have led to a continuing demand for specialists to locate in the region, with specialties such as orthopaedics, obstetrics and gynaecology, and psychiatry leading the list.

However, the public demand for a service cannot be the only determinant of whether or not it should be provided locally (Thomson, 1994). The requirement for specialist services in small populations must be balanced against economic, efficiency, and competency issues. The funding of most specialised services could prove prohibitive in those Northwest LHAs with small populations since, according to Thomson (1994), the

cost of providing some services and their accompanying technologies may come at the expense of other essential services. Citing several studies, he suggested that if specialised services are centralised within a region, the associated costs might be more easily tolerated and a wider spectrum of services provided more efficiently (Thomson, 1994).

It should be noted that specialised medical services are subject to competency issues because of the inherent requirement for constant application of these skills. The specialist that performs a reduced number of diagnoses or procedures and treats few of the complex diseases and conditions for which he or she is trained may find it difficult to maintain competency, impacting negatively on the quality of care. Issues of availability and access must take into account the demands of quality assurance.

Barriers to Medical Services Accessibility. Issues of access arise when services, whether general practitioner or medical specialist, are centralised. The first issue relates to factors of time and distance when residents travel to obtain physician services. The need to travel to obtain medical services can be a deterrent to those seeking care, in view of the time and costs that are involved. Such barriers may delay diagnosis and treatment and further exacerbate the condition of the patient. This has the potential to influence outcomes as some residents will delay seeking care, or not be able to travel at all. This, in turn, relates to the second issue of access which addresses the associated costs of utilising physician services in a centralised location. Although medical services in Canada are provided to residents without expense, the direct costs of travel, accommodation, and meals are very real impediments to accessing physician services in a centralised location. As well, the associated costs of lost wages, child care, and social isolation affect both the patient and their families (British Columbia, 1995b).

Health Status. Only Smithers and Kitimat LHAs had health status values considered to be reasonable, as determined by the provincial interquartile range. The six other LHAs in the Region had values in the lowest quartile, including Telegraph Creek which recorded the worst level in the Province. Examination of the sub-indices indicates that high (meaning a negative contribution to health status) lifestyle index values were a consistent factor contributing to a poor Total Health Status Index score for these six LHAs. This finding supports those of Weller and Manga (1988), Sarsfield (1988), and of the Northern and Rural Health Task Force (British Columbia, 1995b), all of whom stated that the residents of northern, rural and remote regions are especially susceptible to the negative effects of socio-economic factors such as poverty, unemployment, substance abuse, isolation, and a reduced level of education.

These factors are believed to contribute directly and indirectly to the mortality defined more so by the lifestyle index, than by the disease index. For example, mortality from drug and alcohol abuse, suicides, and accidents are more specific to the lifestyle index used in this study. An increased rate of incidence for these events has been linked to lower socio-economic status in some studies (Weller and Manga, 1988; Sarsfield, 1988; British Columbia, 1995b) and should be considered when interpreting the results of this study.

The overall health status of the Northwest Health Region can be described as dichotomous. Smithers and Kitimat enjoy a reasonable level of health status while Terrace, Queen Charlotte, Stikine, Prince Rupert, Nishga, and Telegraph Creek all have levels at the lower end of the provincial values. The reasons for these disparities with the Region are not explained here since the objective was to apply a methodology that

measured the health status of the provincial LHAs. Nevertheless, it is interesting to speculate that Kitimat, as a single industry town with a stable and employed population, does enjoy a lifestyle that leads to enhanced health status for the community and the surrounding LHA. It is not clear, however, why Smithers should be markedly different from, for example, Terrace and Prince Rupert and perhaps a detailed analysis of socio-economic indicators for these LHAs could shed some light on the differences.

Health Status and Physician Services Utilisation. The correlation of health status and the utilisation of physician services indicated that reduced health status is associated with reduced total physician FTEs, reduced general practitioner FTEs, reduced general practitioner utilisation within LHA, and increased medical specialist services per 1000. No association was found, however, between the utilisation of total (i.e., general practitioner and specialist) services or general practitioner services alone and population health status. This lack of association is noteworthy since, given the poor health status of the Region one might expect that there would be a significant correlation with enhanced medical services to meet the needs of the sick population. Alternatively, one might conclude that the medical services that are provided may, in fact, contribute to an enhancements of health status indicators that would otherwise be worse than they are.

The lack of association between physician services and health status also lends strength to the argument of those who subscribe to the determinants of health model, which is critical of the overall contribution that medical services makes to population health (British Columbia, 1994; Foster et al., 1994; Mustard and Frank, 1994).

Limitations of the Study

The results and discussion in this thesis have presented the medical service utilisation and health status levels of the Northwest Health Region of BC. The study has limitations that were outlined in the methodology chapter. These limitations need to be repeated and elaborated here in terms of ensuring that the interpretation of the results is placed in the appropriate context.

Physician Data. Only MSP data were used in this study for both calculating physician supply and the utilisation of medical services. During the course of the study, it became clear that the omission of physicians paid under alternative payment plans could have a significant effect on the results. The numbers of these physicians was learned only on an anecdotal basis and it was not possible, within the confines of this study, to establish whether the inventory was complete and to what extent these physicians provided FTE services and in what context. Further, while the investigator was aware that some specialist services were supplied in the Region under contractual arrangements (e.g. psychiatric services), the full extent of such services was not explored.

The exclusion of diagnostic specialists from this study was based on a deliberate decision based on the fact that there were too few diagnostic specialists in the region during the period of the study to contribute to meaningful investigation. It is believed that the utilisation of diagnostic specialist services is linked closely with the referral and practice patterns of both the general practitioners and medical specialists who provide services to the Region and that a separate study is required using similar methodology.

The Health Status Index. The Health Status Index and the sub-indices represent only one model for the measurement of health status. The values that have resulted from

the use of this model are believed to be valid for this study, however caution should be exercised when using new methodologies to make judgements about health status. The degree of congruence between the Foster et al. (1994) Mosaic of Health Status and the Health Status Indices presented in this study provides only a face validity to the utility of this measure.

The comparison of this model with other models of health status or socio-economic indices, such as those developed in Manitoba (Frohlich and Mustard, 1994; Frohlich and Carriére, 1997) would provide some measure of concurrent validity.

Further Research

Replication of this study in other areas would be a logical first step for future research. For example, urban areas like Victoria or the Lower Mainland could be examined using regions and LHAs, or other areal sub-groupings. The methods used here could also be applied to other provinces, territories and states.

As mentioned above, a comprehensive review of diagnostic specialist services is an obvious extension of this research. This would necessarily be complemented by an analysis of hospital and treatment centre utilisation. Such data is readily available and would have the advantage that diagnoses are attached to hospital discharges enabling a comparison of hospitalisation with the specific disease, birth, and lifestyle measures used in the health status index. To what extent do these death and birth events contribute to hospital utilisation and where does this hospital use take place?

Conclusion

Recent research by the Manitoba Centre for Health Policy and Evaluation helps put the findings of this study into the context of the current debate. Its recent report found

that socio-economic characteristics significantly affect premature mortality. These mortality measures were then developed into a model which determines the need for health care services (Frohlich and Carriére, 1997). The methodology used in this thesis is similar and contributes a uniquely British Columbian perspective to this area of research.

The use of utilisation measures continues to be the primary method by which governments ascertain the need for health care and the associated requirements for physician services. The use of health status measures as an indicator of need have only recently been incorporated into formal planning and the allocation of health resources. Measures of health status can be used by governments to more effectively allocate health resources, including funding, facilities, personnel, and other resources, to regions and local health areas. It is hoped that the present study sheds some light on the relationship between health status and the patterns of medical services utilisation and that this information will help guide future exploration of the ways in which these various indices can be used for health care planning.

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APPENDIX 1:

BRITISH COLUMBIA PHYSICIAN SPECIALTY CLASSIFICATION

GENERAL PRACTITIONER

General Practice
Family Practice
Public Health

MEDICAL SPECIALIST

Dermatology
Neurology
Psychiatry
Neuropsychiatry
Obstetrics and Gynaecology
Ophthalmology
Otolaryngology
General Surgery
Neurosurgery
Orthopaedics
Plastic Surgery
Cardio and Thoracic Surgery
Urology
Paediatrics
Internal Medicine
Anaesthesia
Paediatric Cardiology
Physical Medicine and Rehabilitation
Geriatric Medicine
Emergency Medicine

DIAGNOSTIC SPECIALIST

Radiology
Pathology
Medical Microbiology
Nuclear Medicine

(British Columbia, 1995a)

APPENDIX 2:

HEALTH CANADA FTE DEFINITION AND INTERPRETATION

The Health Canada definition of FTE is defined by the following procedure:

1. Group the physicians into categories by similar styles of practice (this uses 'most recently registered specialty').

2. Sum the fee-for-service payments for each physician, and rank within each style of practice. Payments are included by Date of Service, with a 6 month cut0off (i.e. only those payments made between the beginning of the fiscal year, are included0. Only payments to British Columbia physicians o behalf of MSP subscribers are included. Northern and Isolation Allowance payments are excluded.

3. Determine the 40^{th} and 60^{th} percentiles of total payments for each style of practice (most recent specialty).

4. Associate FTE = 1 with every practitioner with total payments between the 40^{th} and 60^{th} percentiles.

5. Calculate FTE < 1 for all practitioners with total payments below the 40^{th} percentile as follows:

   FTE = (practitioner total)/(40^{th} percentile of total payments)

6. Calculate FTE > 1 for all practitioners with total payments above the 60^{th} percentile as follows:

   let A = (practitioner total)/(60^{th} percentile of total payments)
   Then
   FTE = 1 + *ln*(A)
   where *ln* is the natural logarithm.

7. One modification is required by the Regulations. Specialists practicing in radiology, pathology, medical microbiology, and nuclear medicine are assigned FTE = 1.